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Analysis of Options for Definition of Small Business and Estimated Cost of the Initial Section 8(a) Reporting Requirements

Arthur D. Little, Inc., Cambridge, Mass

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ANALYSIS OF OPTIONS FOR DEFINITION OF SMALL BUSINESS, AND ESTIMATED COST OF THE INITIAL SECTION 8(a) REPORTING REQUIREMENTS

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PLANNING AND MANAGEMENT
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The Toxic Substances Control Act authorized the Environmental Protection Agency to require testing and/or use restrictions on certain chemical substances. As a first step in implementing the Act, EPA is required to compile a list (inventory) of chemicals manufactured, imported or processed in the United States. Manufacturers or importers will be required to submit a premanufacturing notice to the EPA 90 days prior to manufacture or importation of any chemical substance not on the list. The Act provides authority to EPA to collect information for administration of the Act, but also directs the Agency to exempt small businesses from certain reporting requirements. This report analyzes the options for a one-time definition of small business for the EPA's initial Section 8(a) reporting requirements and also provides an estimate of the initial reporting cost. As background, the report also includes a characterization of the chemical industry in terms of sales, employment, number of firms and other parameters. Options for the small business definition were selected on the basis of ease of use and relationship to a firm's ability to bear the burden of the reporting requirements. The initial reporting cost estimate was prepared by working up from a cost per chemical estimate to an aggregated total for the industry.

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Report to

The
United States
Environmental Protection Agency
Office of Planning and Management
Washington, D.C.

November 1977

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I. SUMMARY

A. INTRODUCTION

The Toxic Substances Control Act authorizes the Environmental Protection Agency to require testing and/or use restrictions on certain chemical substances. As a first step in implementing the Act, EPA is required to compile a list (inventory) of chemicals manufactured, imported or processed in the United States. Manufacturers or importers will be required to submit a premanufacturing notice to the EPA 90 days prior to manufacture or importation of any chemical substance not on the list.

The Act provides authority to EPA to collect information for administration of the Act, but also directs the Agency to exempt small businesses from certain reporting requirements. This report analyzes the options for a one-time definition of small business for the EPA's initial Section 8(a) reporting requirements and also provides an estimate of the initial reporting cost.[1] As background, the report also includes a characterization of the chemical industry in terms of sales, employment, number of firms and other parameters.

Options for the small business definition were selected on the basis of ease of use and relationship to a firm's ability to bear the burden of the reporting requirements. The initial reporting cost estimate was prepared by working up from a cost per chemical estimate to an aggregated total for the industry.

B. CHEMICAL INDUSTRY CHARACTERIZATION

In 1976, the total value of sales of the U.S. chemical industry exceeded $100 billion and employment was more than 1.1 million. As is typical of a concentrated industry, a relatively small number of large firms account for the majority of sales and employment.

The chemical industry produces a wide variety of products for many ultimate uses. Most of the larger chemical firms have operations in several sectors of the chemical industry, while smaller, more flexible firms tend to seek market niches not served by the larger firms.

Over the last decade, the after tax profitability of the chemical industry has generally been 6 percent to 8 percent of sales. However, profitability varies significantly between companies and between sectors of the chemical industry. Generally, the smaller firms are somewhat less profitable than the larger firms.

According to the 1972 Census of Manufactures, the value of chemical shipments from establishments outside the chemical industry (SICs 28 and 2911) accounts for less than 1 percent of total chemical value of shipments. Approximately 2,125 firms with total annual sales of $453 billion and total employment of 4.1 million were identified as nonchemical firms with some chemical operations. It is estimated that 80 percent of these firms are chemical processors and 20 percent are chemical manufacturers. The 426 firms producing chemicals are estimated to operate about 1,000 chemical producing establishments and produce a total of about 5,000 chemicals.

1. The initial Section 8(a) reporting requirements require reporting of identities of chemical substances necessary for the compilation of the list. Small businesses are not exempt from this reporting. They also require reporting of other information, such as production volume by site, which is not necessary for the compilation of the list and from which small businesses are exempt.

C. ESTIMATED COST OF INITIAL SECTION 8(a) REPORTING REQUIREMENTS

Preparing an estimate of the initial Section 8(a), "inventory" reporting cost is a difficult task because only limited information is available on the number of chemicals which will be reported and on the actual costs which will be incurred in complying with the reporting requirements. The analysis is also limited by the questionable accuracy of industry statistics in some areas (such as sales and employment), and the total lack of statistics in other areas (such as the number of chemical processors as opposed to manufacturers).

Having dealt with these limits and uncertainties to the extent possible within the time, scope and budget limitations of the study, an estimate of the total inventory reporting cost was prepared. The approach used in preparing this inventory cost was to combine an estimated cost per chemical with estimates of the number of chemicals reported by firms in various size categories and estimates of the number of firms in each size category.

Final estimates of the inventory cost are presented as point estimates for each of seven small business definition options. The estimated inventory costs range from about $10 million if a small business is defined as a firm with annual sales below $100 million, to about $14 million if a small business is defined as a firm with annual sales below $100 thousand.

D. SMALL BUSINESS DEFINITION

On the basis of the analysis performed and suggestions received from both industry and government, it is recommended that the one-time inventory definition of small business be based on a corporate sales level alone or in combination with other parameters. Although the use of corporate sales as a defining criterion has a number of shortcomings, a sales figure has the great advantage of being generally available to those who must decide if the definition is satisfied. The use of other defining criteria would often require a calculation, based on a combination of parameters, which could involve substantial costs and lead to questions of interpretation.

The ideal definition would take into account the number of chemicals produced by a firm and use this to prepare an estimated cost of reporting for the initial inventory. This figure would then be compared with the sales volume (or, better, profit) of the individual firm. However, this approach would be complex, expensive and impossible to oversee. By choosing a simple sales criteria and establishing it at a carefully selected level, the determination of which companies meet the definition is simple and easy to administer, and an unreasonable burden on small business is avoided.

Having analyzed seven possible levels for the sales definition option, five of these are recommended for further consideration by the EPA. These sales values are:

- $ 1 million in latest fiscal[2] year corporate sales,
- $ 2.5 million in latest fiscal year corporate sales,
- $ 5 million in latest fiscal year corporate sales,
- $10 million in latest fiscal year corporate sales, and
- $30 million in latest fiscal year corporate sales.

2. Company fiscal year; may be the same as calendar year.

In noting the increasing cost of reporting, and comparing this to the relatively slow improvement in coverage of chemicals produced (measured in terms of sales), this range of $1 to 30 million seems to encompass the inflection point after which the cost of reporting additional information begins increasing more rapidly than does the chemical coverage.

The relative levels of chemical firm, establishment, sales and employment coverage achieved at each of seven levels of a sales definition are contrasted with the relative cost of each definition in Table I-1. For the purpose of this report, chemical sales are probably the best single measure of coverage. As indicated in the table, and graphically illustrated in Figure I-1, the rate of increase in percent chemical sales coverage is slower than the rate of increase in cost for definition levels smaller than about $30 million. Below $5 million in sales, the inventory cost increases about four times as fast as the coverage level.

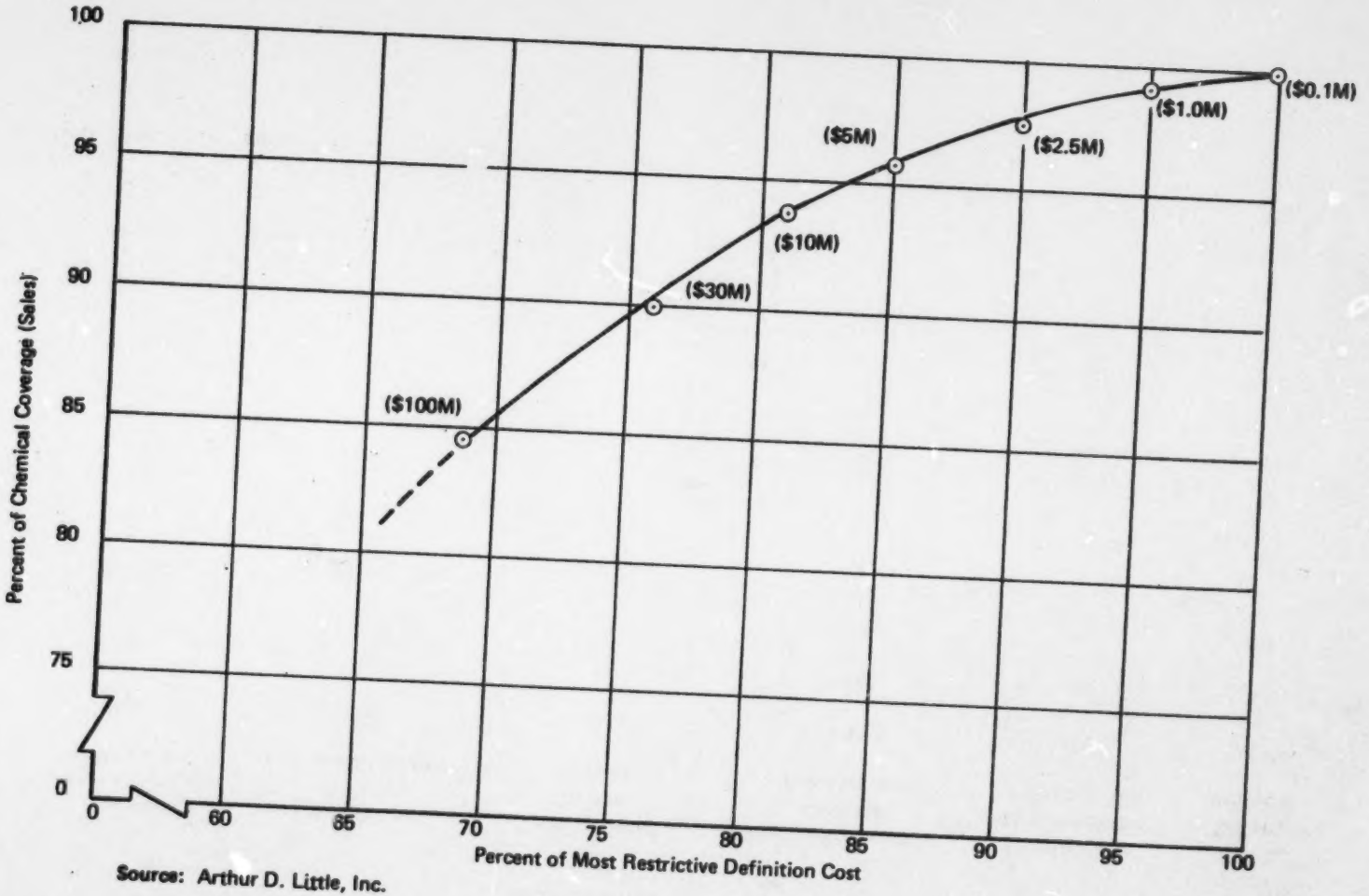
TABLE I-1

COMPARISON OF CHEMICAL INDUSTRY COVERAGE AND
PERCENT OF TOTAL INVENTORY COST AT VARIOUS DEFINITIONAL LEVELS FOR
SMALL BUSINESS

Definition Sales Level Less Than (million $)	Chemical[1] Firm Coverage (% firms)	Establishment[1] Coverage (% establishments)	Chemical Sales[2] Coverage (% sales)	Chemical Employment[2] Coverage (% employment)	Percent of[1] Most Restrictive Definition Cost	Total[1] Cost to Industry (million $)
0.1	97	98	100	100	100	14.4
1.0	56	72	99	99	95	13.7
2.5	34	54	98	97	90	12.9
5.0	22	45	96	95	85	12.2
10.0	15	38	94	92	81	11.6
30.0	9	31	90	89	76	10.9
100.0	6	24	84	83	69	9.9

1. Reflects all firms required to report.
2. Reflects only SICs 28 and 2911 which account for over 99% of total sales of SIC 28 and 2911 products.

Source: Arthur D. Little, Inc., estimates.



Source: Arthur D. Little, Inc.

FIGURE I–1 GRAPH OF PERCENT CHEMICAL INDUSTRY COVERAGE (SALES) VERSUS PERCENT OF MOST RESTRICTIVE DEFINITION (0.1 MILLION SALES) INVENTORY COST FOR SEVEN SMALL BUSINESS DEFINITIONAL LEVELS

II. INTRODUCTION

A. BACKGROUND

The Toxic Substances Control Act (TSCA), Public Law 94-469, was signed into law on October 11, 1976 and became effective on January 1, 1977. As a first step in implementing this law, the EPA is required under Section 8(b) to compile, keep current, and publish a list (the inventory) of chemical substances which are manufactured, imported, or processed for commercial purposes in the United States. Chemical substances not appearing on the inventory will be considered new chemical substances and will be subject to premanufacturing notification, as required by Section 5 of TSCA, prior to their manufacture or processing for commercial purposes.

For the purpose of compiling the inventory, EPA, under the authority of Section 8(a) of TSCA, is requiring chemical manufacturers to report concerning those substances manufactured since January 1977. In addition to the chemical name for the inventory, EPA is also requiring that manufacturing site(s) and order-of-magnitude production volume(s) be reported as part of the initial Section 8(a) reporting requirements. While Section 8(a) of the Act provides broad authority to EPA to collect information for administration of the Act, EPA can only require "small manufacturers and processers" (small businesses) to submit information necessary for compilation of the initial inventory and to submit other limited information if specific findings are made and rule-makings are initiated under Sections 4, 6, or 5(b)(4) of TSCA or if a court has granted relief under Section 5 or 7. For the initial inventory, production volume and manufacturing site information may not be necessary for the compilation of the list of chemical substances required by Section 8(b) and, therefore, small businesses may be exempt from reporting this information. Although the legislative history makes it clear that those falling under the small business definition are to be protected from unreasonably burdensome requirements, the Act leaves to the EPA Administrator's discretion the definition of "small manufacturer or processer."

Finally, Executive Order 11821 (as extended) requires the preparation of an Economic Impact Analysis Statement to accompany any major Agency action: in general defined as any action for which annualized costs exceed $100 million, or for which the unit cost exceeds 5 percent of the product price. This study also contains the cost analysis used in making the determiniation that additional economic impact analysis is not required.

B. PURPOSE AND SCOPE

This report provides an analysis of the options for a one-time definition of small business for the initial TSCA inventory reporting requirements (the inventory), and also provides an estimate of the total cost of compliance with these inventory requirements.

The project scope included, as a first step, a broad-brush characterization of the chemical industry. The chemical industry was first defined as consisting of those establishments having primary activities in standard industrial classifications (SICs) 28 and 2911, but excluding 283 (drugs) and 2879 (pesticides). This exclusion is based on the exclusion of drugs and pesticides from coverage by TSCA. While it is recognized that some chemicals covered by TSCA may be produced by firms in these SICs (283 and 2879), these chemicals are believed to represent only a very small fraction of the chemical production in these classifications. Second, an attempt was made to extend the chemical industry definition to identify and include those firms producing some chemicals, but whose primary activity is classified outside SICs 28 and 2911. The scope of work also included preparation of an estimated cost for the initial inventory, a discussion of selected options for defining small business, and, finally, presentation of a set of recommended options for this one-time definition.

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The scope of work did not include an evaluation of the overall cost of the Act nor an analysis for use in defining small businesses for any other Section 8(a) requirements or for Section 26. Also excluded was a quantitative review of the benefits to EPA of the additional information concerning chemical production volume (by site) which would be available if small businesses were required to provide this information. Qualitatively, order-of-magnitude production information can be useful to the EPA in setting priorities for the allocation of Agency resources to specific existing or potential chemical problems. Site-specific production data can be used for regulatory, inspection and monitoring actions by EPA and other Federal agencies. To the extent that these data are useful, having them available for as many production sites as possible is desirable. On the other hand, TSCA requires that the burden on small businesses not be unreasonable and, therefore, the Agency must make a judgment in choosing a small business definition which optimizes this information/burden trade-off.

C. APPROACH

This study was carried out between mid-August and mid-November, 1977. The analysis was performed using information and expertise supplied by a variety of sources, including representatives of both industry and government. The statistical data on the chemical industry was compiled from such sources as the EPA, the Small Business Administration, the U.S. Department of Commerce, Dun and Bradstreet, Inc., the Manufacturing Chemists Association, and trade publications. This industry information provided the basic background used in selecting a set of options for the definition of a small business and for calculation of the estimated inventory reporting cost.

Options for the definition of a small business were selected on the basis of ease of application and relationship to burden on these companies. Suggestions from a variety of sources were considered. These included the Small Business Administration, the Office of Management and Budget, the Environmental Protection Agency, and chemical firm and industry association representatives. Various measures of size and compliance capability were included in the review of definitional options. These included assets, total sales, sales per chemical, production volume, number of plant sites and employment.

The recommended final options for the small business definition were chosen through consideration of the results of the analysis and of suggestions presented by the EPA, the Small Business Administration, the Office of Management and Budget, industry associations and individual firms. The selection of a preferred definition from among the final options was left to EPA because consideration should be given to factors which are beyond the scope of this study and which may affect the choice of a definition. These considerations include the value of the additional information which would be obtained under a relatively limited or restrictive definition of small business, and an evaluation of the administrative burden of processing the data which would be received under a limited definition.

The total cost of compliance estimate for the initial inventory was prepared on the basis of a cost per establishment calculation which was combined with an estimate of the number of establishments which are expected to report. This estimate was corroborated through discussions with representatives of small, medium, and large chemical firms in representative sectors of the chemical industry. The estimates were also compared with estimates made by EPA and those submitted to EPA in response to a request for comments on the cost of the inventory reporting requirements.

III. CHARACTERIZATION OF THE CHEMICAL INDUSTRY

A. INTRODUCTION

The U.S. chemical industry encompasses a broad range of operations and a wide variety of products. Generalizations concerning the chemical industry as a whole cannot be attributed to any single sector of the industry or any individual firm. While such information is available for larger chemical firms, little information is publicly available for the smaller firms in the industry.

Nevertheless, as a basis for characterization of the chemical industry, Dun and Bradstreet (D&B) data on value of sales, employment, and number of firms by chemical industry sector (four-digit SIC code) were used. The data on the chemical industry (SIC 28) include some unknown amount of non-chemical sales and employment information. Non-chemical sales and employment could not be separated from chemical sales and employment using the information available because D&B's classification of firms by industry does not exactly coincide with the Bureau of Census classification. However, the data were adjusted to exclude sectors of the chemical industry whose primary products are not covered by the Toxic Substances Control Act (such as the drug and pesticide sectors, SICs 283 and 2879) and to include the petroleum refining industry (SIC 2911) which is required to report for the inventory. While a significant volume of petrochemicals are produced by petroleum refineries, petrochemical value of sales is estimated to be less than 10 percent of all sales by petroleum refineries.

Based upon analysis of the data provided, a small number of large firms account for a high percentage of total chemical industry sales and employment. While the U.S. chemical industry is generally more profitable than most industries, industry profitability varies significantly from year to year. More importantly, profitability varies widely between sectors of the industry and from firm to firm.

B. SALES

In 1976, total sales of the U.S. chemical industry exceeded $100 billion. The 50 largest chemical companies had chemical sales of approximately $60 billion in 1976 as shown in Table III-1. While the names of several industry giants often come to mind when the chemical industry is discussed, over 10,000 firms comprise the industry. Major sectors of the chemical industry include:

- Industrial inorganic chemicals,
- Plastics and synthetic materials,
- Drugs (not regulated by TSCA),
- Soaps, cleaners and toilet goods,
- Paints and allied products,
- Industrial organic chemicals,
- Agricultural chemicals (pesticides are not regulated by TSCA), and
- Miscellaneous chemical products.

TABLE III-1

THE FIFTY LARGEST U.S. CHEMICAL PRODUCERS – 1976

Company	Chemical[1] Sales ($ millions)	Total Sales ($ millions)	Chemical Sales[1] as Percent of Total Sales	Net Income ($ millions)	Net Profit (%)
Du Pont	$6,400	$ 8,361	77	$ 459.3	5.5
Dow Chemical	3,900	5,652	69	612.8	10.8
Union Carbide	3,800	6,346	60	441.2	7.0
Monsanto	3,577	4,270	84	366.3	8.6
Exxon	3,238	48,631	7	2,641.0	5.4
W.R. Grace	1,961	3,651	54	131.9	3.6
Celanese	1,926	2,123	91	69	3.3
Allied Chemical	1,738	2,630	66	126.3	4.8
Shell Oil	1,574	9,230	17	705.8	7.6
Occidental Petroleum	1,401	5,534	25	183.7	3.3
Hercules	1,325	1,596	83	106.8	6.7
Eastman Kodak	1,247	5,438	23	650.6	12.0
American Cyanamid	1,190	2,094	57	135.8	6.5
Borden	1,115	3,381	33	112.8	3.3
Rohm & Haas	1,096	1,153	95	(11.8)	–
Standard Oil (Ind.)	1,080	11,532	9	893.0	7.7
Gulf Oil	1,062	16,451	6	816	5.0
Mobil Oil	1,027	26,063	4	942.5	3.6
Ethyl Corp.	1,009	1,135	89	69.1	6.1
Stauffer Chemical	1,000	1,100	91	113.0	10.3
Phillips Petroleum	990	5,698	17	411.7	7.2
Texaco	950	26,452	4	869.7	3.3
PPG Industries	804	2,255	36	151.5	6.7
Diamond Shamrock	802	1,357	59	140.0	10.3
FMC	801	2,145	37	80.2	3.7
Air Products	793	818	97	63.5	7.8
International Minerals	780	1,260	62	135.4	10.7
Ashland Oil	743	4,087	18	136.0	3.1
B.F. Goodrich	695	1,996	35	15.8	0.8
Ciba-Geigy	690	975	71	–	–
Standard Oil of Cal.	685	19,434	4	880.1	4.5
NL Industries	680	1,286	53	58.8	4.6
BASF Wyandotte	675	710	95	34.9	4.9
Olin	657	1,377	48	72.6	5.3
U.S. Steel	648	8,604	8	410.3	4.8

TABLE III-1 (Continued)

Company	Chemical[1] Sales ($ millions)	Total Sales ($ millions)	Chemical Sales[1] as Percent of Total Sales	Net Income ($ millions)	Net Profit (%)
American Hoechst	$ 600	$ 745	80	$	
Reichhold Chemicals	585	585	100	16.1	2.7
Mobay Chemical	545	545	100	20.1	3.7
Atlantic Richfield	534	8,463	6	575.2	6.8
National Distillers	507	1,504	34	90.3	6.0
Williams Co.	481	1,003	48	61.2	6.1
Esmark	453	5,268	9	82.6	1.6
Lubrizol	451	451	100	51.0	11.3
Kerr-McGee	437	1,955	22	134.1	6.9
Tenneco	437	6,423	7	383.5	6.0
Goodyear Tire	425	5,791	7	122.0	2.1
Akzona	423	729	58	5.6	0.8
Pennwalt	419	777	54	34.9	4.5
Borg-Warner	399	1,862	21	81.7	4.4
Continental Oil	385	7,958	5	460.0	5.8

1. Chemical sales data include sales of drugs and pesticides which are not regulated by the Toxic Substances Control Act.

Source: CHEMICAL AND ENGINEERING NEWS, May 2, 1977.

The chemical industry produces a wide variety of products for many ultimate uses. Broadly speaking, three categories of chemicals are produced:

- Basic chemicals used in the production of other chemicals,
- Chemical products used by other industries before ultimate sales to consumers, and
- Finished chemical products for consumer use.

In characterizing the chemical industry for purposes of an analysis of sales, two major sectors have been excluded because their primary products are regulated by other legislation: drugs (SIC 283, which includes biological products, medicinals and botanicals, and pharmaceutical preparations), and pesticides (SIC 2879, which includes insecticides, fungicides and rodenticides). Petroleum refining (SIC 2911) has been included because of the significant volume of petrochemicals produced within this sector and because petrochemicals must be reported on the initial inventory. Petrochemical production is estimated to account for less than 10 percent of the value of sales of the petroleum refining industry. Arthur D. Little, Inc., estimates that refinery production of petrochemicals totaled $3.3 billion in 1976. The D&B data show total refinery sales of $40 billion in 1976. While refinery sales are believed to be closer to $65 billion in 1976, using the D&B estimate of $40 billion in sales, petrochemical sales of refineries are conservatively estimated to be less than 10 percent of total refinery sales. This report uses 10 percent of the D&B sales of refineries as the sales figure for refinery produced petrochemicals.

Based upon an analysis of data compiled by D&B, a characterization of the chemical industry in terms of annual sales per firm is shown in Tables III-2, 3, and 4. Some 170 firms with annual sales of over $100 million account for over 80% of the total industry sales. The smallest sales category, firms with sales of less than $100,000 per year, is comprised of over 1,500 firms with total combined sales of less than $100 million. Most firms in this size range are believed to be chemical processors.

Table III-5 shows the number of firms, value of sales, and number of employees by industry sector. The sectors with the largest value of sales include:

- Industrial inorganic chemicals,
- Plastics materials and resins,
- Organic fibers,
- Soaps and detergents,
- Toilet preparations,
- Industrial organic chemicals, and
- Petroleum refining.

C. EMPLOYMENT

The 1977 U.S. Industrial Outlook estimates total chemical industry employment to be approximately 1.1 million persons, while the statistics shown in Table III-6 include over 1.7 million persons. The difference is due to the fact that the latter statistics include some non-chemical employment for chemical companies and that the definition of a chemical producer

TABLE III-2

STATISTICS ON U.S. CHEMICAL FIRMS GROUPED BY ANNUAL SALES OF FIRM – 1976[1]
(includes SICs 28XX and 2911 except 283X and 2879)

Annual Sales Range ($ million)	Number of Firms	Number of Employees	Annual Sales ($ million)	Percentage of Firms (%)	Percentage of Employees (%)	Percentage of Sales (%)
0.0 - 0.1	1,541	4,700	66	18.9	0.3	0.1
0.1 - 1.0	3,694	34,769	1,306	45.4	2.3	1.2
1.0 - 2.5	1,343	37,165	2,017	16.5	2.4	1.9
2.5 - 5.0	603	31,371	1,868	7.5	2.0	1.8
5.0 - 10.0	376	34,326	2,351	4.6	2.2	2.2
10.0 - 30.0	284	58,797	4,213	3.5	3.9	3.9
30.0 - 100.0	126	86,415	5,600	1.5	5.6	5.3
100.0 -	170	1,251,318	87,551	2.1	81.3	83.4
Subtotal	8,137	1,538,861	104,972	100.0	100.0	100.0
Unknown[2]	2,578	99,031	–	–	–	–
Total	10,715	1,637,892	104,972	–	–	–

1. Petrochemical production of petroleum refineries (SIC 2911) accounts for less than 10% of the value of sales of refineries. Employment and sales data for SIC 2911 were included at 10% of total employment and sales of SIC 2911.
2. Annual sales data for 2,578 firms employing 99,031 persons were not available.

Source: Arthur D. Little, Inc., estimates based on Dun and Bradstreet data.

TABLE III-3

AVERAGE EMPLOYEES, SALES, AND SALES PER EMPLOYEE FOR U.S. CHEMICAL FIRMS GROUPED BY ANNUAL SALES OF FIRM – 1976[1]
(includes SICs 28XX and 2911 except 283X and 2879)

Annual Sales Range ($ million)	Number of Firms	Number of Employees	Annual Sales ($ million)	Employees Per Firm	Annual Sales Per Firm ($ million)	Annual Sales Per Employee ($ thousand)
0.0 - 0.1	1,541	4,700	66	3	0.04	14
0.1 - 1.0	3,694	34,769	1,306	9	0.35	38
1.0 - 2.5	1,343	37,165	2,017	28	1.5	54
2.5 - 5.0	603	31,371	1,868	52	3.1	59
5.0 - 10.0	376	34,326	2,351	91	6.3	68
10.0 - 30.0	284	58,797	4,213	207	14.8	72
30.0 - 100.0	126	86,415	5,600	686	44.4	65
100.0 -	170	1,251,318	87,551	7,360	515.0	70
Subtotal	8,137	1,538,861	104,972	189	12.9	68
Unknown[2]	2,578	99,031	–	38	–	–
Total	10,715	1,637,892	104,972	153	–	–

1. Petrochemical production of petroleum refineries (SIC 2911) accounts for less than 10% of the value of sales of refineries. Employment and sales data for SIC 2911 were included at 10% of total employment and sales of SIC 2911.
2. Annual sales data for 2,578 firms employing 99,031 persons were not available.

Source: Arthur D. Little, Inc., estimates based on Dun and Bradstreet data.

TABLE III-4

CUMULATIVE STATISTICS ON U.S. CHEMICAL FIRMS GROUPED BY ANNUAL SALES OF FIRM – 1976[1]
(includes SICs 28XX and 2911 except 283X and 2879)

Annual Sales Less Than ($ million)	Cumulative Number of Firms	Cumulative Number of Employees	Cumulative Annual Sales ($ million)	Cumulative Percentage of Firms (%)	Cumulative Percentage of Employees (%)	Cumulative Percentage of Sales (%)
0.1	1,541	4,700	66	18.9	0.3	0.1
1.0	5,235	39,469	1,372	64.3	2.6	1.3
2.5	6,578	76,634	3,384	80.8	5.0	3.2
5.0	7,181	108,005	5,257	88.3	7.0	5.0
10.0	7,557	142,331	7,608	92.9	9.2	7.2
30.0	7,841	201,128	11,821	96.4	13.1	11.3
100.0	7,967	287,543	17,421	97.9	18.7	16.6
Subtotal	8,137	1,538,861	104,972	100.0	100.0	100.0
Unknown[2]	2,578	99,031	–	–	–	–
Total	10,715	1,637,892	104,972	–	–	–

1. Petrochemical production of petroleum refineries (SIC 2911) accounts for less than 10% of the value of sales of refineries. Employment and sales data for SIC 2911 were included at 10% of total employment and sales of SIC 2911.
2. Annual sales data for 2,578 firms employing 99,031 persons were not available.

Source: Arthur D. Little, Inc., estimates based on Dun and Bradstreet data.

TABLE III-5

U.S. CHEMICAL INDUSTRY - 1976
NUMBER OF FIRMS, ANNUAL SALES, AND EMPLOYMENT BY INDUSTRY SECTOR

SIC Code	Industry Sector	Number of Firms	Annual Sales ($ million)	Employees	Sales per Firm ($ million)	Employees per Firm	Sales per Employee ($ 000)
2812	Alkalies and Chlorine	58	5,644	75,808	102.6	1,378	74.5
2813	Industrial Gases	119	2,551	46,494	21.4	391	54.9
2816	Inorganic Pigments	113	817	17,858	7.2	158	45.7
2818[1]	Organic Chemicals, n.e.c.	7	5	105	0.7	15	47.6
2819[1]	Industrial Inorganic Chemicals	998	12,749	211,882	12.8	212	60.2
2821[1]	Plastics Material and Resins	806	7,091	102,961	8.8	128	68.9
2822	Synthetic Rubber	130	513	6,936	3.9	53	74.0
2823	Cellulosic Man-Made Fibers	31	2,557	52,608	82.5	1,697	48.6
2824	Organic Fibers	67	11,829	208,189	176.6	3,107	56.8
2841	Soaps, Detergents	586	9,555	96,229	16.3	164	99.3
2842[1]	Polishes and Sanitary Goods	1,464	3,372	56,879	2.3	39	59.3
2843	Surface Acting Agents	130	517	5,034	4.0	39	102.7
2844	Toilet Preparations, Perfumes	1,030	11,419	197,086	11.1	191	57.9
2851[1]	Paints and Allied Products	1,416	4,581	88,293	3.2	62	51.9
2861	Gum, Wood Chemicals	105	171	3,604	1.6	34	47.4
2865	Cyclic Crudes and Intermediates	126	1,609	25,666	12.8	204	62.7
2869	Industrial Organic Chemicals	335	15,884	234,016	47.4	699	67.9
2871[1]	Fertilizers	4	1	17	0.3	4	58.8
2873	Nitrogenous Fertilizers	261	4,419	33,147	16.9	127	133.3
2874	Phosphatic Fertilizers	93	2,960	24,283	31.8	261	121.9
2875	Mixing Fertilizers	278	831	10,156	3.0	37	81.8
2891[1]	Adhesives and Sealants	503	1,426	21,772	2.8	43	65.5
2892	Explosives	62	312	6,464	5.0	104	48.3
2893	Printing Ink	228	1,231	21,616	5.4	95	56.9
2895	Carbon Black	6	452	7,034	75.3	1,172	64.3
2899[1]	Chemical Preparations	1,426	4,524	66,308	3.2	46	68.2
2911	Petroleum Refining[2]	336	4,091	17,447	12.2	52	234.5
	Total	10,715	111,113[3]	1,637,892	10.4[3]	153	67.8

1. Indicates 1967 SIC codes not yet totally converted to 1972 SIC codes by D&B.
2. Statistics for the petroleum refining industry include only chemical products. It is estimated that chemical sales and employment account for less than 10% of petroleum refining sales and employment.
3. These figures include an estimated $6,141 million in sales for 2,578 firms with unknown sales data. Therefore, these figures do not agree with the figures on Tables III-2 through III-4. The estimated sales were computed using the number of employees of firms with unknown sales data, and the sales per employee for firms with sales data for each four digit SIC code.

Source: Arthur D. Little, Inc., estimates based on Dun and Bradstreet data.

TABLE III-6

CUMULATIVE STATISTICS ON U.S. CHEMICAL FIRMS BY EMPLOYMENT SIZE OF FIRM – 1976
(includes SICs 28XX and 2911 except 283X and 2879)

Employment Less Than	Cumulative Number of Firms	Cumulative Number of Employees	Cumulative Annual Sales ($ million)	Cumulative Percentage of Firms (%)	Cumulative Percentage of Employees (%)	Cumulative Percentage of Sales (%)
5	3,311	8,238	338.6	30.9	0.5	0.3
10	5,752	23,239	1,024.1	53.7	1.4	0.9
50	9,194	91,932	5,016.1	85.8	5.6	4.5
100	9,899	135,754	7,818.1	92.4	8.3	7.0
250	10,339	191,922	11,357.2	96.5	11.7	10.2
500	10,499	241,826	14,574.9	98.0	14.8	13.1
1,000	10,595	297,368	18,087.5	98.9	18.2	16.3
1,500	10,636	340,706	22,023.6	99.3	20.8	19.8
Total	10,715	1,637,892	111,113.0[1]	100.0	100.0	100.0

1. The total sales of $111 billion differs from the totals shown in Tables III-2 through III-4 because data include the estimated sales for the 2,578 firms with unknown sales data. This total agrees with that in Table III-5.

Source: Arthur D. Little, Inc., estimates based on Dun and Bradstreet data.

includes more companies than the U.S. Department of Commerce definition. In either case, the data clearly support the fact that the 170 largest chemical companies, with firm sales of over $100 million per year, employ over 80 percent of all workers in the chemical industry as shown in Table III-2. Furthermore, sales per employee, as shown in Table III-3, increases as the size of the firm (as measured by value of sales) increases. The largest firms have an average of over $70,000 in sales per employee, while the smallest firms average only $14,000 in sales per employee. This reflects the higher percentage of labor-intensive processors among the smaller firms. The industry sectors with the largest number of employees are the same sectors as those listed above having the largest value of sales.

D. NUMBER OF FIRMS

Over 10,000 firms have been identified as comprising the chemical industry. The number of firms may be described by sales volume as shown in Tables III-2 through III-4. As shown in Table III-2, the vast majority of the firms in the chemical industry have less than $10 million per year in sales. As expected, the average number of employees per firm increases with size as characterized by value of sales. The industry sectors with the largest number of firms include:

- Industrial inorganic chemicals,
- Plastic materials and resins,
- Polishes and sanitary goods,
- Toilet preparations,
- Paints and allied products, and
- Chemical preparations, n.e.c.

There are three sectors of the chemical industry with a large number of firms but a relatively low number of employees and sales — polishes and sanitary goods, paints, and chemical preparations, not elsewhere classified.

E. PROFITABILITY

Table III-7 shows the before-tax and after-tax profitability of the chemical industry from 1964 through mid-1977 as reported by the Federal Trade Commission and the Manufacturing Chemists Association. While after-tax profitability varies from year to year, aftertax profit has generally been 6 percent to 8 percent of sales in recent years. Table III-1 provides an indication of the variation in after-tax profit between firms for the fifty largest chemical producers. In 1976, after-tax profit as a percentage of sales varied from negative values to 12.0 percent.

F. NUMBER OF CHEMICALS

It is difficult to estimate the number of different chemicals commercially produced by the U.S. chemical industry. The Stanford Research Institute (SRI) Handbook enumerates over 10,000 chemicals. The EPA candidate list contains over 30,000 chemicals. The Chemical Abstract Service has assigned CAS Registry numbers to several million different chemicals. As a lower bound, it is reasonable to assume that most of the 10,000 chemicals listed by SRI are produced in commercial quantities. However, the upper bound for the number of commercial chemicals produced remains a matter for speculation. A reasonable estimate may be approximately 100,000 based on the number of establishments required to report and the number of chemicals per establishment.

TABLE III-7

INCOME OF U.S. CHEMICAL INDUSTRY 1964-1977

Year	Net Sales ($ million)	Income Before Tax ($ million)	Income After Tax ($ million)	Income After Tax as a Percent of Sales
1964	36,300	NA	2,900	7.9
1965	40,100	NA	3,200	7.9
1966	44,500	NA	3,500	7.8
1967	47,500	NA	3,260	6.9
1968	52,000	NA	3,530	6.8
1969	55,500	NA	3,590	6.5
1970	58,100	NA	3,430	5.9
1971	62,020	6,700	3,778	6.1
1972	69,338	7,788	4,422	6.4
1973	83,581	9,978	5,686	6.8
1974	84,928	10,285	7,152	8.4
1975	88,168	9,668	6,703	7.6
1976	101,809	11,268	7,610	7.5
1977 (6 mo.)	53,699	6,181	4,182	7.8

Source: Federal Trade Commission, Quarterly Financial Reports, 1971-1977; Manufacturing Chemists Association, Chemical Industry Facts, 1964-70.

Approximately 50 chemicals are produced in quantities of over 1 billion pounds each. Almost 300 chemicals are produced in quantities of over 10 million pounds per chemical. Generally, production volume data is unavailable for chemicals produced in quantities of under 1 million pounds per chemical. It is believed that the 300 chemicals produced in quantities of over 10 million pounds each account for over 90 percent of the total weight of all chemicals produced.

G. CONCENTRATION

Concentration ratios for sectors of the chemical industry as determined by the 1972 Census of Manufactures are presented in Table III-8. The percentage of total sector sales is shown for the largest 4, 8, 20, and 50 firms in each industry sector. Based upon a review of industry concentration ratios for previous Census years, it has been determined that although there is a slight trend toward increased concentration, concentration ratios have remained relatively stable with time.

The Census does not provide a concentration ratio for the chemical industry as a whole, so concentration ratios were estimated for the chemical industry in 1976. Using the chemical sales values of the 50 largest U.S. chemical producers shown in Table III-1, and estimating total chemical industry sales to be $100 billion in 1976, concentration ratios were computed for the chemical industry as a whole and are shown in Table III-8. A small number of larger firms in the chemical industry account for the vast majority of chemical sales. The largest 50 chemical firms accounted for almost 60 percent of the industry value of sales in 1976. Most of the larger chemical firms have operations in several sectors of the chemical industry, but generally not in all industry sectors.

H. ESTIMATED NUMBER OF PROCESSING/MANUFACTURING FIRMS

No published information was available to determine the number of firms manufacturing or producing chemicals (i.e., where a molecular change occurs) and the number of firms simply processing chemicals (i.e., mixing or formulating chemicals). Since firms processing chemicals are not required to report for the initial inventory, an estimate was made of the number of processing firms that would be excluded from reporting.

Table III-9 shows the percentage of firms in each four-digit SIC code of the chemical industry estimated to be chemical processors. The estimate was made based upon the knowledge of Arthur D. Little, Inc., specialists. Estimates are necessarily approximate to the nearest 10 percent and are judgmental because data are not available. Overall, 5,740 of the 10,715 firms or 54 percent were estimated to be processors. Many processing firms were found in the following sectors:

- Soaps and detergents,
- Polishes and sanitary goods,
- Toilet preparations and perfumes,
- Paints and allied products,
- Mixing fertilizers,
- Adhesives and sealants,
- Printing ink, and
- Chemical preparations, n.e.c.

TABLE III-8

CHEMICAL INDUSTRY CONCENTRATION RATIOS (1972)

SIC Code	Industry	Percentage of Total Industry Value of Shipments			
		4 Largest Companies	8 Largest Companies	20 Largest Companies	50 Largest Companies
2812	Alkalies and Chlorine	72	91	99	100
2813	Industrial Gases	65	81	93	98
2816	Inorganic Pigments	52	72	91	99
2819	Industrial Inorganics, n.e.c.	34	52	76	93
2821	Plastics Material and Resins	26	41	65	90
2822	Synthetic Rubber	62	81	98	100
2823	Cellulosic Man-made Fibers	96	–	100	–
2824	Organic Fibers, Noncellulosic	74	91	99	100
2831	Biological Products	37	53	82	95
2833	Medicinals and Botanicals	59	75	90	98
2834	Pharmaceuticals	26	44	75	91
2841	Soap and Detergents	62	74	85	92
2842	Polishes & Sanitation Goods	43	54	65	78
2843	Surface Acting Agents	28	42	64	89
2844	Toilet Preparations	38	53	74	91
2851	Paints and Allied Products	22	34	51	66
2861	Gum and Wood Chemicals	68	83	94	99
2865	Cyclic Crudes & Intermediates	34	52	77	96
2869	Industrial Organics, n.e.c.	43	57	74	92
2873	Nitrogenous Fertilizers	35	53	84	100
2874	Phosphatic Fertilizers	29	47	83	99
2875	Fertilizers, Mixing Only	24	38	57	74
2879	Agricultural Chemicals, n.e.c.	39	57	76	89
2891	Adhesives and Sealants	19	31	52	76
2892	Explosives	67	86	98	99
2893	Printing Ink	39	54	75	88
2895	Carbon Black	74	99	100	–
2899	Chemical Preparations, n.e.c.	16	26	41	58
28	Chemicals and Allied Products (1976)[1]	18	27	41	59
2911	Petroleum Refining	31	56	84	96

1. Concentration ratios for the Chemical and Allied Products industry were estimated by Arthur D. Little, Inc., for the year 1976. The Census does not provide concentration ratios for the chemical industry as a whole, but only for individual sectors. Using an estimated total industry sales of $100 billion in 1976 and chemical sales of the fifty largest firms shown in Table III-1, concentration ratios were computed for the industry as a whole.

Source: U.S. Department of Commerce, 1972 Census of Manufactures, Subject and Special Statistics, MC72(SR2), and Arthur D. Little, Inc., estimates.

TABLE III-9

ESTIMATED NUMBER OF CHEMICAL PROCESSING FIRMS BY CHEMICAL INDUSTRY SECTOR – 1976

SIC Code	Industry Sector	Number of Firms	Processor Firms (%)	Number of Processing Firms
2812	Alkalies and Chlorine	55	0	0
2813	Industrial Gases	119	0	0
2816	Inorganic Pigments	113	20	23
2818[1]	Organic Chemicals, n.e.c.	7	0	0
2819[1]	Industrial Inorganic Chemicals	998	10	100
2821[1]	Plastics Material and Resins	806	10	81
2822	Synthetic Rubber	130	50	65
2823	Cellulosic Man-made Fibers	31	80	25
2824	Organic Fibers	67	60	40
2841	Soaps, Detergents	586	70	410
2842[1]	Polishes and Sanitary Goods	1,464	80	11
2843	Surface Acting Agents	130	10	13
2844	Toilet Preparations, Perfumes	1,030	90	927
2851[1]	Paints and Allied Products	1,416	90	1,275
2861	Gum, Wood Chemicals	105	20	21
2865	Cyclic Crudes and Intermediates	126	10	13
2869	Industrial Organic Chemicals	335	10	34
2871[1]	Fertilizers	4	0	0
2873	Nitrogenous Fertilizers	261	0	0
2874	Phosphatic Fertilizers	93	0	0
2875	Mixing Fertilizers	278	80	222
2891[1]	Adhesives and Sealants	503	80	400
2892	Explosives	62	40	25
2893	Printing Ink	228	80	182
2895	Carbon Black	6	0	0
2899[1]	Chemical Preparations	1,426	50	713
2911	Petroleum Refining[2]	336	0	0
	Total[2]	10,715	54	5,740

1. Indicates 1967 SIC codes not yet totally converted to 1972 SIC codes by Dun & Bradstreet.
2. Statistics for the petroleum refining industry include only chemical products. It is estimated that chemical sales and employment account for less than 10% of petroleum refining sales and employment.

Source: Arthur D. Little, Inc., estimated based on Dun and Bradstreet data.

Table III-10 shows the number of producing and processing firms by size of firm in terms of annual value of sales. The 2,578 firms for which D&B sales data are unavailable were also shown as processors. Based on the number of employees per firm, these 2,578 firms are typical of chemical industry firms with annual sales of less than $100 million. The remaining processing firms were assigned primarily to the smallest annual sales categories. Contacts with industry confirmed the belief that processors tend to be the smaller firms.

Table III-11 shows chemical manufacturing firms (excluding processing firms) arranged by annual value of sales per firm. For each category of annual sales per firm, the number of firms, number of employees and total annual sales are provided. Approximately 4,975 chemical manufacturing firms are shown with total sales of nearly $104 billion and total employment of 1.5 million workers. Manufacturing firms with annual sales less than $5 million per year represent over 80 percent of all manufacturing firms, but only 4 percent of manufacturing sales and 5 percent of employment.

TABLE III-10

NUMBER OF CHEMICAL PROCESSING AND CHEMICAL MANUFACTURING FIRMS BY SIZE OF FIRM BASED ON ANNUAL SALES[1]

Annual Sales ($ million)	Number of Firms	Estimated Number of Processors[2]	Number of Manufacturers
Unknown[3]	2,578	2,578	0
0.0 - 0.1	1,541	1,400	141
0.1 - 1.0	3,694	1,500	2,194
1.0 - 2.5	1,343	200	1,143
2.5 - 5.0	603	30	573
5.0 - 10.0	376	20	356
10.0 - 30.0	284	12	272
30.0 - 100.0	126	0	126
100.0 - 10,000.0	170	0	170
Total	10,715	5,740	4,975

1. Includes SIC 28XX and 2911, except SIC 283X and 2879.
2. Based upon interviews with industry and Arthur D. Little knowledge of the chemical industry; the smaller the firm, the more likely the firm is a processor. The number of processors was estimated by using a high percentage of smaller firms and lower percentages of larger firms.
3. The D&B data included 2,578 firms for which annual sales value is unknown.

Source: Arthur D. Little, Inc., estimates based on Dun and Bradstreet data.

TABLE III-11

U.S. CHEMICAL MANUFACTURING FIRMS BY SIZE BASED ON ANNUAL SALES OF FIRM – 1976
(excluding processing firms)
(includes SICs 28XX and 2911 except 283X and 2879)

Annual Sales Range ($ million)	Number of Firms	Number of Employees	Annual Sales ($ million)	Percentage of Firms (%)	Percentage of Employees (%)	Percentage of Sales (%)
0.0 - 0.1	141	430	6	2.8	0.03	0.006
0.1 - 1.0	2,194	20,650	775	44.2	1.4	0.75
1.0 - 2.5	1,143	31,630	1,715	23.0	2.1	1.65
2.5 - 5.0	573	29,800	1,775	11.5	2.0	1.7
5.0 - 10.0	356	32,500	2,225	7.2	2.2	2.1
10.0 - 30.0	272	56,330	4,035	5.4	3.7	3.9
30.0 - 100.0	126	86,420	5,600	2.5	5.7	5.4
100.0 -	170	1,251,320	87,550	3.4	82.9	84.5
Total	4,975	1,509,080	103,681	100.0	100.0	100.0

Source: Arthur D. Little, Inc., estimates based on Dun and Bradstreet data.

IV. INVENTORY COST AND SMALL BUSINESS DEFINITION FOR CHEMICAL FIRMS

A. INTRODUCTION

An estimate of the total cost of the TSCA inventory may be approached in several ways. In this chapter, the estimate is based on a calculated reporting cost per chemical in combination with an estimate of the number of chemicals which will be reported — either in toto, or by individual establishments. In Chapter VI, additional inventory cost estimates are developed on the basis of a more detailed examination of the inventory reporting costs of firms in selected size categories.

B. ANALYSIS OF INDIVIDUAL CHEMICAL REPORTING COSTS

As with most operating costs, the cost to a firm (or establishment) of complying with the TSCA inventory requirements may be broken down into fixed and variable components. For example, the cost of a staff member's time spent in familiarizing him or herself with the specific requirements of the inventory is a relatively fixed cost, in the sense that it is little affected by the number of chemicals which a firm may report. In contrast to this, the time spent in collecting production information for a chemical may be considered a variable cost, in the sense that this time will vary considerably with the number of chemicals reported.

A detailed breakdown of incremental fixed and variable costs for preparing the EPA inventory reporting forms is presented in Tables IV-1 and IV-2. The individual time and cost estimates shown in these tables are based on numerous simulations of an inventory form completion experience and on estimated wage and overhead rates for the levels of skill required for each task. Comments by industry contacts have also been taken into account in these estimates.

As indicated in Table IV-1, a fixed charge of $300 per establishment is viewed as a reasonable estimate for the incremental fixed cost of preparing the required inventory forms. This includes eight hours for familiarization with the forms, instructions and general requirements of the Act and promulgated regulation for reporting, as well as additional time and cost allowances for setup, final review of the completed forms, and expenses such as postage.

The estimated variable cost per chemical is derived in the second part of Table IV-1. In preparing this estimate of variable cost, the existence of three classes of chemicals was taken into account: 1) chemicals which are found on the EPA Candidate List, 2) chemicals which are not found on the list but which have Chemical Abstract Service (CAS) Registry numbers assigned to them, and 3) chemicals not on the list and without CAS Registry numbers. Each class of chemical has associated with it a different time allocation to allow for the variation in the estimated time required to collect the information necessary for completion of the different inventory forms. The results of considering these three classes of chemicals are combined on the basis of their estimated frequency of reporting, using a weighted average derived from industry comments and an analysis of the fraction of chemicals in each class. The weighted average variable cost per chemical per establishment is thus estimated to be $100.

TABLE IV-1

ESTIMATED FIXED AND VARIABLE COMPONENTS OF INVENTORY REPORTING COST
(incremental costs for inventory)

I. Fixed Cost/Establishment

	Task	Hours	Cost/Hour	Task Cost
A.	Familiarization	8	$20	$160
B.	Facilities, Postage, etc.	–	–	30
C.	Set Up, Type Company Info.	2	10	20
D.	Review of Completed Form	3	30	90
	Total Fixed Charge Per Establishment			$300

II. Variable Cost/Chemical/Establishment for Reporting Chemical Identity and Production Information

	Task	Time/Chemical Reported		
		Chemical Listed on EPA Candidate List	Not on Candidate List	
			With CAS Registry No.	Without CAS Registry No.
A.	Collect Information on Production (order of magnitude)	180 min.	180 min.	180 min.
B.	Find CAS Registry No. or provide necessary information	–	150 min.	480 min.
C.	Fill in Form (includes looking up chemicals in Candidate List)	10 min.	10 min.	20 min.
D.	Review Form, Decide on Confidentiality	30 min.	30 min.	30 min.
E.	Final Typing	10 min.	10 min.	20 min.
	Total Time/Chemical	230 min.	380 min.	730 min.

Weighted Average[1] Total Time/Chemical = 300 min. = 5 hr.

Total Variable Cost/Chemical/Establishment (at $20/hr.[2]) = $100.00

1. Weighting based on estimate that 65% of commercial chemicals are on Candidate List; 30% are not on Candidate List but have CAS Registry Number; 5% are unlisted.
2. Weighted average cost per hour, based on 10% of effort costed at $10/hr., 80% at $20/hr., and 10% at $30/hr.

Source: Arthur D. Little, Inc., estimates.

TABLE IV-2

ESTIMATED VARIABLE COST PER CHEMICAL PER ESTABLISHMENT FOR REPORTING CHEMICAL IDENTITY ONLY

Task		Time/Chemical Reported		
		Chemical Listed on EPA Candidate List	Not on Candidate List	
			With CAS Registry No.	Without CAS Registry No.
A.	Find CAS Registry No. or Provide Necessary Information	–	150 min.	480 min.
B.	Fill in Form (includes looking up chemicals in Candidate List)	10 min.	10 min.	20 min.
C.	Review Form, Decide on Confidentiality	30 min.	30 min.	30 min.
D.	Final Typing	10 min.	10 min.	20 min.
	Total Time/Chemical	50 min.	200 min.	550 min.

Weighted Average[1] Total Time/Chemical = 120 min. = 2 hr.

TOTAL VARIABLE COST/CHEMICAL/ESTABLISHMENT (at $20/hr.[2]) = $40.00

1. Weighting based on estimate that 65% of commercial chemicals are on Candidate List; 30% are not on Candidate List but have CAS Registry Number; 5% are unlisted.
2. Weighted average cost per hour, based on 10% of effort costed at $10/hr., 80% at $20/hr., and 10% at $30/hr.

Source: Arthur D. Little, Inc., estimates.

Because the exemption from reporting chemical production is the main feature differentiating the small company, it is worth noting that the cost of collecting production information is estimated to be about $60 per chemical (on the basis of 3 hours or 180 min. at $20/hour).[1] This task, therefore, accounts for about three-fifths of the variable cost of inventory reporting. With this information it is possible to calculate the level of sales required for a single chemical to support the incremental cost of submitting production information — given an assumption of an economic impact measure of "reasonableness." For example, as illustrated in Figure IV-1, if a cost amounting to 1% of after-tax profits is viewed as reasonable, then a firm having an after-tax profit rate of 6 percent will not be unreasonably burdened by a $60 reporting cost for a chemical having annual sales of $100,000.[2]

Using the graphs in Figures IV-1 and IV-2 it is possible to determine the average sales level per chemical which would be required to avoid an unreasonable burden under a variety of assumed costs and levels of impact. Furthermore, if this approach is combined with an estimate of the average number of chemicals per firm, it is possible to approach a definition of small business on this basis. For example, a firm reporting 100 chemicals would require a sales level of $10 million ($100,000 x 100) to avoid an unreasonable burden under the sample profit and percent of profit conditions discussed above. An added consideration is that because this is a one-time charge, the costs could, in theory, be spread over a period of several years. This would reduce the level at which reporting costs would be considered a burden.

Having calculated incremental fixed and variable costs for inventory reporting, it is possible to estimate a total cost per firm, and a total cost per chemical for firms reporting various numbers of chemicals. This is done, in Table IV-3, for one chemical, five chemicals and so on, up to a hypothetical 10,000 chemicals per establishment.

As may be seen by examining the graph of these data in Figure IV-3 the total reporting cost per chemical drops off rapidly from $400 for one chemical, to $130 for 10 chemicals, to $103 for 100 chemicals. In fact, at a level of about 15 chemicals or more, the fixed costs represent less than 20 percent of total reporting cost. One implication of this is that, for most establishments, the variable cost components — such as the cost of collecting production data — become the major costs for preparing the inventory. This, in turn, means that the total cost of the inventory to the chemical industry will be affected by the cost of the time required to collect production information and by the small business definition, which exempts companies from this requirement.

According to the preceding analysis, the cost of collecting production information represents half of the total reporting cost for an establishment reporting 15 chemicals.[3] For establishments reporting more than 15 chemicals, the production reporting cost could become the largest single cost element.

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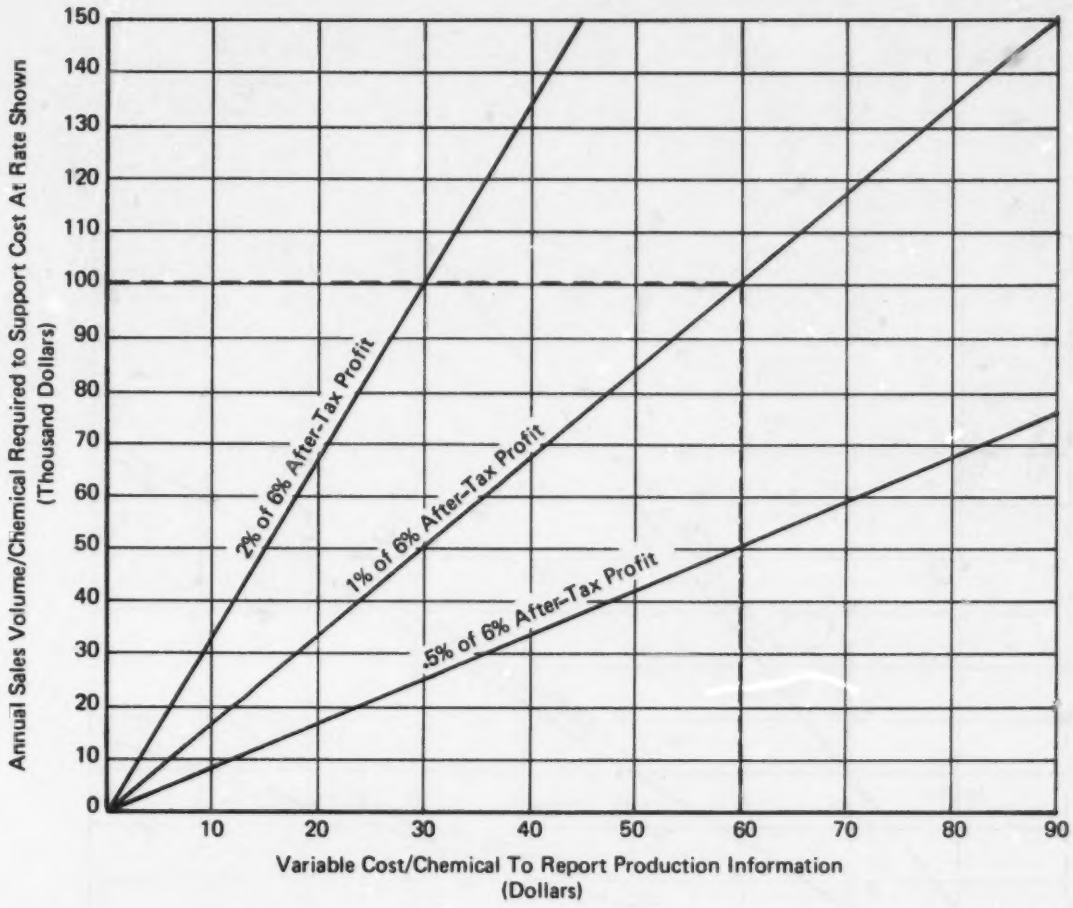
1. As with the other fixed and variable cost estimates comprising the basis for the inventory reporting costs, the time required for collecting production information was estimated by considering the individual steps necessary to accomplish the required task. Where possible these steps were carried out for selected chemicals in order to arrive at an appropriate time estimate. In this case it is estimated that 3 hours allows sufficient time to compile order-of-magnitude production data from customer invoices, if necessary, and this is therefore believed to be a conservative estimate of the cost.

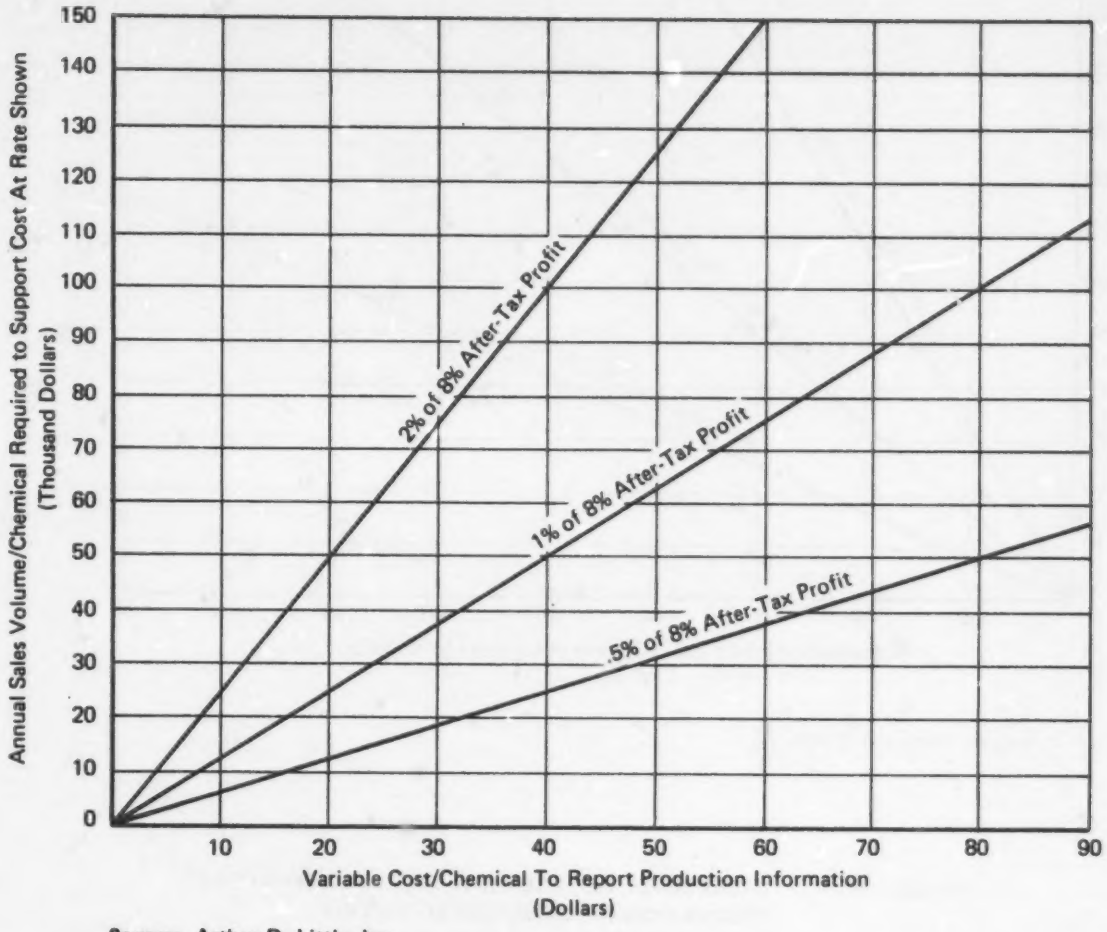
2. Calculated as follows: $100,000 sales x .06 profit rate = $6,000 profit; $6,000 profit x .01 assumed reasonable reporting cost rate = $60).

3. Calculated as follows: 15 chemicals x $60 = $900; $900 ÷ $1,800 ($300 fixed cost + 15 x $100 variable cost) = 50 percent.



Source: Arthur D. Little, Inc.

FIGURE IV–1 SALES LEVEL PER CHEMICAL REQUIRED TO SUPPORT PRODUCTION INFORMATION REPORTING (ASSUMING PROFITS OF 6% OF SALES)



Source: Arthur D. Little, Inc.

FIGURE IV–2 SALES LEVEL PER CHEMICAL REQUIRED TO SUPPORT PRODUCTION INFORMATION REPORTING (ASSUMING PROFITS OF 8% OF SALES)

TABLE IV-3

ESTIMATED INVENTORY COST PER ESTABLISHMENT AND PER CHEMICAL FOR VARIOUS NUMBERS OF CHEMICALS TO BE REPORTED

No. of Chemicals Reported Per Establishment	Total Cost[1] Per Establishment	Cost/Chemical Per Establishment
1	400	400
5	800	160
10	1,300	130
50	5,300	106
100	10,300	103
500	50,300	100.60
1,000	100,300	100.30
5,000	500,300	100.06
10,000	1,000,300	100.03

1. Consisting of $300 fixed cost per establishment and $100 variable cost per chemical.

Source: Arthur D. Little, Inc., estimates.

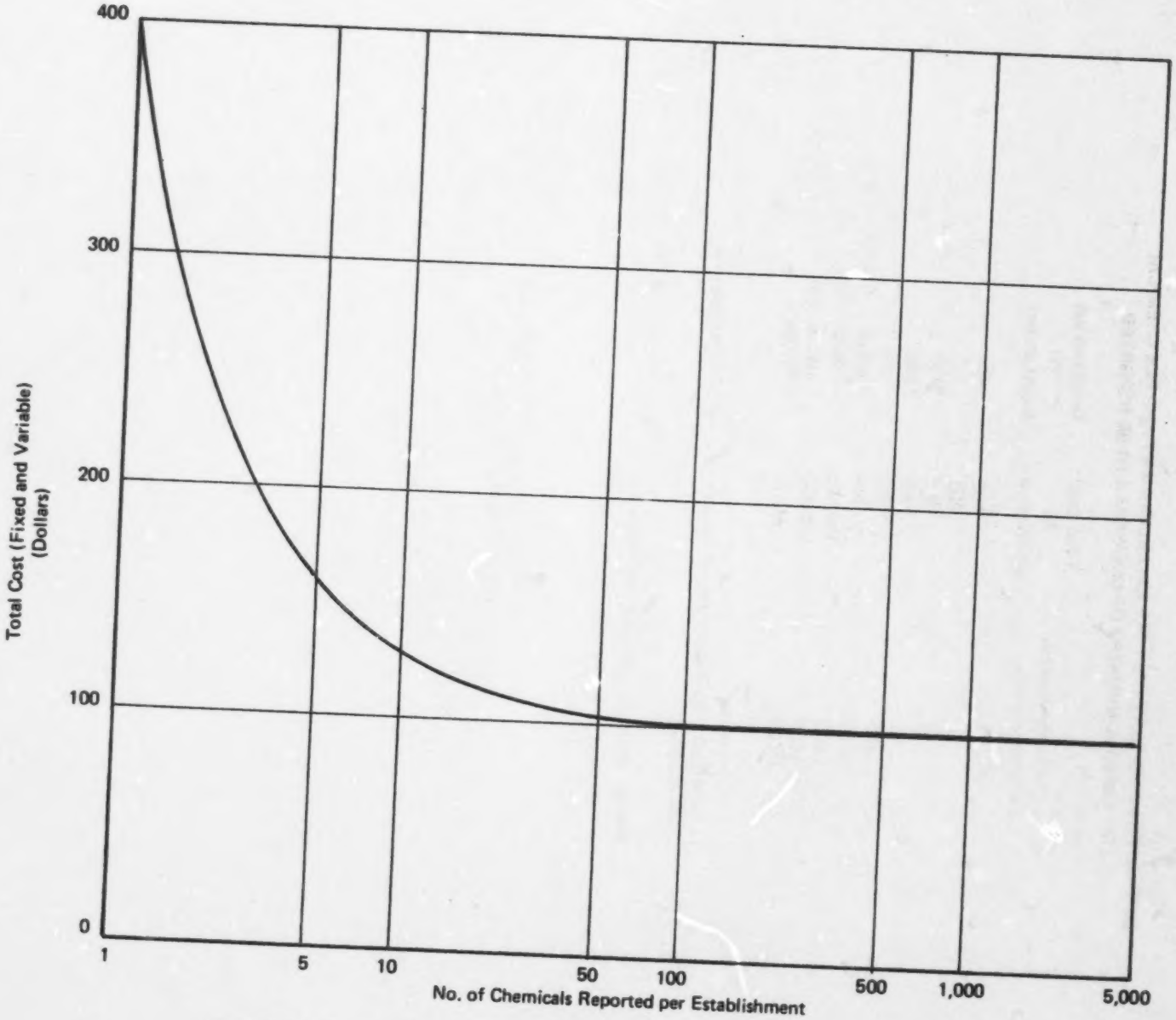


FIGURE IV–3 ESTIMATED INVENTORY COST PER CHEMICAL PER ESTABLISHMENT FOR VARIOUS NUMBERS OF CHEMICALS TO BE REPORTED

C. ESTIMATED COST OF INITIAL INVENTORY REPORTING FOR CHEMICAL FIRMS

An estimate of the total cost of the inventory was prepared, as shown in Table IV-4, on the basis of an estimated cost per chemical (as derived above) and an estimated number of chemicals to be reported, prepared on a per establishment basis.

The number of chemical reports was calculated assuming that approximately 5,000 manufacturing firms in SICs 28 and 2911, except 283 and 2879 (see Table III-1 1), will report for the initial inventory. These firms have a weighted average of approximately 1.5 establishments per firm (see Table VI-4), or a total of 7,500 establishments. These establishments produce an average of 15 reportable chemicals each. This number was derived from comments and interviews with industry and from an analysis of the SRI Directory of Chemical Producers. It also corresponds to the weighted average number of chemicals per establishment shown in Table VI-4. Using this estimate, reporting is, therefore, expected on about 112,500 chemicals. The average cost for an establishment reporting 15 chemicals is $120 per chemical ($300 fixed cost plus $100 per chemical variable cost, divided by 15).

On the basis of this analysis, the total cost of the inventory for all chemical manufacturing firms will be about $13.5 million dollars.

A similar calculation was performed for the non-chemical sector firms which manufacture chemical substances and are required to report. The cost to these firms is approximately $800,000. Therefore, the maximum total inventory cost is approximately $14.3 million for all those required to report.

This estimate assumes that no businesses are classified as small and therefore that all establishments will be required to report order-of-magnitude production volume on all chemicals.

TABLE IV-4

ESTIMATED INVENTORY COST – CHEMICAL BASIS[1]

I.	**For SIC 28,2911 Firms**	
	Estimated Number of Chemical Manufacturing Firms	5,000
	Estimated Number of Establishments/Firms	1.5
	Estimated Total Number of Establishments	7,500
	Estimated Number of Chemicals/Establishments	15
	Estimated Total of Chemicals Reported	112,500
	Average Cost Per Chemical of Reporting	$120
	Subtotal Cost for Chemical Firms	$13.5 million
II.	**For Other Firms Manufacturing Chemicals (see Chapter VII)**	
	Estimated Number of Establishments	1,000
	Estimated Number of Chemicals/Establishment	5
	Estimated Number of Chemicals Reported	5,000
	Average Cost Per Chemical of Reporting	$160
	Subtotal Cost for Other Firms	$800,000
III.	**Total Cost of Reporting**	$14.3 million

1. Assumes that all companies would have to report production by site.

Source: Arthur D. Little, Inc., estimates.

V. OPTIONS FOR SMALL BUSINESS DEFINITION

A. INTRODUCTION

In passing the Toxic Substances Control Act (TSCA), Congress required that small businesses be exempted from certain record-keeping and reporting requirements of the law in order to "protect small manufacturers and processors from unreasonably burdensome requirements." In order that the EPA comply with this provision of the law, a definition of "small manufacturer," taking the burden to small businesses into account, is required for the initial Section 8(a) reporting requirements (the inventory).

These inventory reporting regulations are likely to require a more encompassing definition of "small manufacturer" than other reporting regulations, since the inventory reporting is likely to be less burdensome to the companies required to report than future requirements under Section 8(a). However, it is recognized that this requirement will affect a larger number of firms. This chapter deals primarily with the analysis of options for a definition of which firms should qualify as small manufacturers for the purposes of these initial Section 8(a) inventory reporting requirements.

The overall objective of the TSCA reporting section may be stated as giving the EPA the authority to gather information necessary for the administration of the Act without unreasonably burdening small manufacturers. Information gathered under TSCA is to be shared with other Federal government agencies. This information could be used by a variety of government agencies, including the EPA, for such purposes as:

- Determining which industrial plant may be responsible for suspected discharge of a chemical,
- Determination of worker exposure to selected chemicals, and
- Providing government agencies with a data base for setting priorities on suspected toxic chemicals and taking actions affecting the chemical industry.

As an overall approach to defining small businesses for the purpose of the inventory, three steps are proposed:

- Select parameters which may be used to describe a small manufacturer,
- Screen these parameters for usefulness, ease of definition, and implementability, then
- Determine hurdle criteria for each parameter, i.e., "draw the line" with quantitative measures that separate small manufacturers from other manufacturers.

In the following sections, these three steps are discussed and some general industry statistics are displayed to provide policy makers with information indicative of the number of firms or establishments affected by alternative definitions.

B. POSSIBLE PARAMETERS FOR DEFINITION

The legislative history of TSCA makes if clear that the intent of Congress is to require a definition based on the firm rather than the individual establishments. That is, the choice of

parameters describing a small manufacturer should be applied to the total of all establishments owned or controlled by that manufacturer. On this basis, the parameters available for a small business definition include company sales, sales per chemical, assets, employment, manufacturing sites, and production volume.

1. Company Sales

Annual sales (f.o.b. plant) is probably the single most useful parameter. Sales are well known by manufacturers and often reported internally and externally. While some firms may experience fluctuations in sales from year to year across whatever sales value may be chosen to define a small manufacturer, the number of such firms is likely to be small relative to the total number of firms. A manufacturer can easily determine the firm's sales and know whether reporting is required. Sales is also useful as a criterion in determining the reasonableness of burden since it provides some indication of a company's ability to divert cash flow to reporting costs. Generally, the larger the sales, the larger the staff employed by a firm; therefore, sales provides a general indication of the number of employees and, hence, a rough indication of work place exposure. A disadvantage of sales is that it does not provide an accurate picture of the value added by the manufacturer, which is a better indicator of the firm's ability to bear the reporting cost burden.

2. Sales Per Chemical

The cost or burden of the reporting requirements increases with the number of chemicals to be reported by a manufacturer. A parameter such as sales per chemical to be reported would provide a good measure of the ability of a firm to manage the reporting requirements for an individual chemical. On the other hand, while a manufacturer could determine the number of chemicals to be reported, information on sales per chemical is not publicly available at this time. Thus, this parameter would be difficult to implement although it does provide a useful measure of reasonableness of burden. While some measure of sales per reported chemical may not be appropriate in determining the definition of a small manufacturer because of implementation problems, consideration was given to this measure in determining the cost impact of the inventory reporting requirement (see Chapter IV).

3. Assets

The value of assets employed by the firm is a possible parameter for a small business definition. Assets provide an indication of the size of the firm and a general indication of the reasonableness of the reporting cost or burden. However, some specific definitions of assets would have to be determined in implementing this parameter. Total gross assets employed would include such long-term assets as properties, plant and equipment, investments, and deferred charges; and such current assets as cash, short-term investments, accounts receivable, inventories and prepaid expenses. Defining each of these components of total assets would be difficult; e.g., EPA would need to determine whether plant and equipment should be valued at cost or at market value. Thus, there may be some difficulty in using this parameter (for the EPA, or for the manufacturers) because a determination would need to be made as to whether the firm has sufficient assets to be required to report. Despite these problems, some value of assets could be useful in defining a small business, if it were used in combination with some other parameter.

4. Employment

Some measure of the number of employees (total employment, non-operating employment or operating employment) may be a useful parameter for a definition of small business. In fact,

this is the measure used by the Small Business Administration to define small businesses in the manufacturing sector. This parameter is also of interest to OSHA in determining the number of workers potentially exposed. However, some difficulties with this parameter are apparent. For example, a business may be seasonal and the number of employees may vary through the year. In this case, a previous year's average employment may be a more useful criterion. In addition, the number of employees is not necessarily correlated with the number of chemicals to be reported and, therefore, the total cost of inventory reporting.

If non-operating employment were used as the criterion, the reasonability of the reporting requirement could be more properly assured. However, it is difficult to define a non-operating employee — while some cases are clear, other cases may not be so clear; e.g., a foreman whose primary responsibility is supervisory and reporting, but occasionally fills in for absent operating employees.

5. Manufacturing Sites

The number of manufacturing sites (establishments) may be a useful parameter if used in combination with another parameter such as sales. For example, in addition to some value of sales, a small manufacturer could be defined as having only one manufacturing site. It is possible that some otherwise small manufacturers may have several very small manufacturing sites. However, in such cases, this information would be useful to EPA particularly if toxic substances are shipped between sites.

6. Production Volume

Finally, the annual production volume of a given chemical may be used as a parameter for defining a small business. Currently, such information is not publicly available for most chemicals. Using this parameter would require manufacturers to collect information not necessarily gathered now in order to screen chemicals that would have to be reported. While the definition is clear, it could be difficult to implement for both manufacturers and the EPA. On the other hand, some threshold level of annual chemical production, in conjunction with a less restrictive small business definition, could be used to reduce the number of chemicals reported by firms — by exempting a large number of firms except for those chemicals with large production volume. This would reduce the burden to the small manufacturers and yet provide the EPA with reporting on all large production volume chemicals. It would also allow the EPA to be more lenient in defining who qualifies as a small manufacturer because it would significantly reduce the uncertainties concerning the information reported under the regulations.

C. POSSIBLE LEVELS FOR DEFINITION OF SMALL BUSINESS

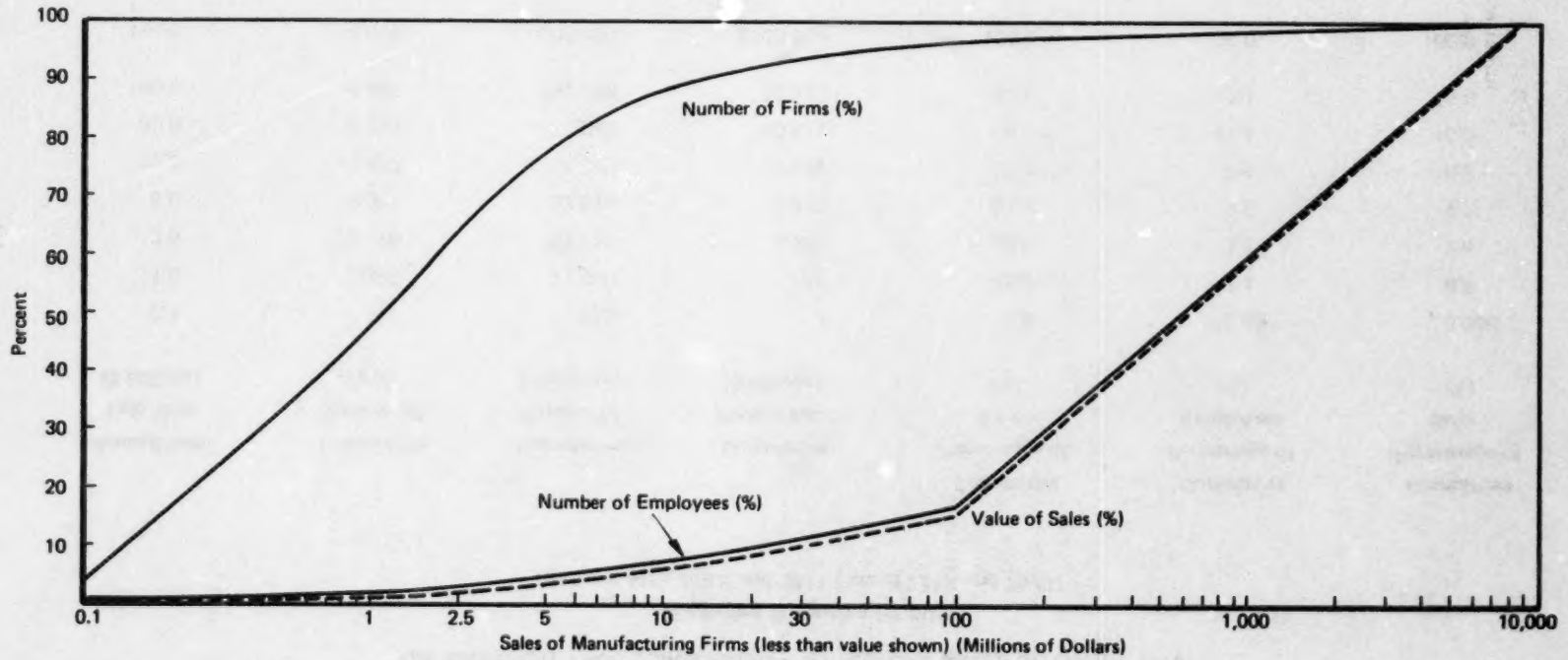
While all six of the parameters discussed above are possible choices for use in defining a small manufacturer, comprehensive data are not available by firm for sales per chemical, value of assets, number of manufacturing sites, or production volume. In discussing the possible impact of certain values of hurdle criteria for the parameters defining a small business, one is basically limited to annual sales and number of employees. Since employment is generally closely correlated with sales, and sales is preferred over employment as a means of defining a small business, only different values of sales are further analyzed. Sales and assets are also closely correlated, so using one of these criteria essentially includes the other. As a general rule, assets are approximately 50 percent of sales in the chemical industry, although this figure varies between firms and segments of the chemical industry. In the following, the number of companies affected is estimated depending upon the hurdle criterion chosen for a definition of small businesses in the chemical industry, based on annual sales.

Table V-1 shows the cumulative number of firms, employees and annual sales for chemical manufacturing firms grouped by value of sales per firm. If annual sales were used to define a small business, the number of firms exempted at various levels of annual sales per firm would be as shown in the table. For example, firms with less than $10.0 million in sales per year may be characterized as accounting for:

4,407 firms (88.6 percent of all chemical manufacturing firms),
115,010 employees (7.6 percent of all chemical employees),
and $6.5 billion annual sales (6.3 percent of chemical sales).

These characteristics are illustrated in Figure V-1 for various definitions of a small business.

From Table V-1, it may be determined that a small number of firms (170 firms) with annual sales of over $100 million account for over 80 percent of total industry sales and employment. From the point of view of cost-effective coverage of the chemical industry, it is clear that imposing reporting requirements on a relatively small number of very large firms will provide substantial coverage. However, from the point of view of knowing where most toxic or potentially toxic substances are produced, and in what quantities, coverage of more firms may be necessary.



Source: Arthur D. Little, Inc.

FIGURE V–1 CHEMICAL INDUSTRY STATISTICS BY SIZE OF FIRM

TABLE V-1

U.S. CHEMICAL PRODUCING FIRMS – BY ANNUAL SALES OF FIRM – 1976

(Excluding Processing Firms)

(Includes SICs 28XX and 2911 Except 283X and 2879)

Annual Sales Less Than ($ Million)	Cumulative Number of Firms	Cumulative Number of Employees	Cumulative Annual Sales ($ Million)	Cumulative Percentage of Firms (%)	Cumulative Percentage of Employees (%)	Cumulative Percentage of Sales (%)
0.1	141	430	6	2.8	0.03	0.006
1.0	2,335	21,080	781	46.9	1.4	0.8
2.5	3,478	52,710	2,496	69.9	3.5	2.4
5.0	4,051	82,510	4,271	81.4	5.5	4.1
10.0	4,407	115,010	6,496	88.6	7.6	6.3
30.0	4,679	171,340	10,531	94.0	11.4	10.2
100.0	4,805	257,760	16,131	96.6	17.1	15.6
Total	4,975	1,509,080	$103,681	100.0	100.0	100.0

Source: Arthur D. Little, Inc., estimates.

VI. RECOMMENDED OPTIONS FOR SMALL BUSINESS DEFINITION

A. PARAMETERS FOR DEFINITION

As previously discussed, it is possible to analyze the impact of a small business definition based upon a firm's annual sales or employment but not possible for assets, sales per chemical, number of manufacturing sites or production volume. Furthermore, within the chemical industry, the average value of sales per employee is relatively constant across sectors of the industry. As shown in Table VI-1, the average value of sales per employee for SIC 28 is $66,050 with a range among industry sectors of $45,700 to $133,300. The petroleum refining industry has very high sales per employee, approximately $234,500 per employee. Since sales per employee is relatively constant within the chemical industry, a definition of small manufacturer based upon number of employees would be roughly comparable to a definition based upon an annual value of sales.

While sales per employee does not vary significantly among sectors of the industry, it does vary significantly depending upon size of the firm (as defined by annual sales), as shown in Table VI-2. Firms with annual sales of less than $100,000 have an average of $14,000 in sales per employee. Firms with annual sales of over $100 million have an average of $70,000 in sales per employee.

The Small Business Administration (SBA) suggested a definition of a small business for the purposes of the TSCA inventory of 100 employees per firm. The SBA notes that the August 2, 1977 EPA re-proposed inventory reporting regulations proposed a small business definition of less than $100,000 in annual sales. While the EPA proposed definition would classify almost 20 percent of the firms in the industry as small businesses, the SBA stated that they believed that such firms would be mostly processors and would not include many, if any, chemical manufacturers. The proposed SBA definition of 100 employees would require full reporting on chemicals representing over 90 percent of the value of sales and employment in the industry, but would require only 8 percent of the firms to report production volume information (by site). At the average chemical industry value of sales per employee of $68,000 (including chemical production in the petroleum refining industry), the SBA proposed definition of a small business (100 employees or less) would be equivalent to sales of $6.8 million per year or less.

Because sales data is more readily available than employment data, a small business definition based upon annual sales appears to be the most readily implementable. Also, as discussed earlier, a sales-based definition provides a better indication of the reasonableness of the reporting cost or burden than does an employee-based definition.

B. ESTIMATED COST OF INVENTORY REPORTING FOR SELECTED SMALL BUSINESS DEFINITIONS

As discussed in Chapter IV, the cost of the inventory reporting to a firm is dependent upon a number of factors:

- Number of chemicals produced,
- Number of manufacturing sites, and
- Whether the firm is a small business or a large business for the purposes of reporting.

TABLE VI-1

AVERAGE SALES PER EMPLOYEE BY INDUSTRY SECTOR

SIC Code	Industry Sector	Value of Sales Per Employee
2812	Alkalies and Chlorine	$74,500
2813	Industrial Gases	54,900
2816	Inorganic Pigments	45,900
2819	Industrial Inorganic Chemicals	60,200
2821	Plastics Material and Resins	68,900
2822	Synthetic Rubber	73,900
2823	Cellulosic Man-Made Fibers	48,600
2824	Organic Fibers	56,800
2841	Soaps, Detergents	99,300
2842	Polishes and Sanitary Goods	59,300
2843	Surface Acting Agents	102,700
2844	Toilet Preparations, Perfumes	57,900
2851	Paints and Allied Products	51,900
2861	Gum, Wood Chemicals	47,500
2865	Cyclic Crudes and Intermediates	62,700
2869	Industrial Organic Chemicals	67,900
2873	Nitrogenous Fertilizers	133,300
2874	Phosphatic Fertilizers	121,900
2875	Mixing Fertilizers	81,800
2891	Adhesives and Sealants	65,500
2892	Explosives	48,300
2893	Printing Ink	57,000
2895	Carbon Black	64,300
2899	Chemical Preparations	68,200
28xx	Chemicals and Allied Products	66,050
2911	Petroleum Products[1]	$234,500
Weighted Average		$ 67,800

1. Petrochemical production of petroleum refineries (SIC 2911) accounts for less than 10% of the value of sales of refineries. Employment and sales data for SIC 2911 were included at 10% of total employment and sales of SIC 2911.

Source: Arthur D. Little, Inc., estimates based on Dun and Bradstreet data.

TABLE VI-2

AVERAGE SALES PER EMPLOYEE BY SIZE OF FIRM BASED ON ANNUAL SALES

Average Annual Sales ($ Million)	Sales Per Employee
0.0 - 0.1	$14,000
0.1 - 1.0	38,000
1.0 - 2.5	54,000
2.5 - 5.0	59,000
5.0 - 10.0	68,000
10.0 - 30.0	72,000
30.0 - 100.0	65,000
Over 100.0	70,000
Weighted Average	68,000

Source: Arthur D. Little, Inc., estimates based on Dun and Bradstreet data.

The cost of inventory reporting has been estimated for seven different levels of annual sales per firm that could be used to define a small business:

$ 100,000 annual sales,
$ 1,000,000 annual sales,
$ 2,500,000 annual sales,
$ 5,000,000 annual sales,
$ 10,000,000 annual sales,
$ 30,000,000 annual sales, and
$100,000,000 annual sales.

The estimated unit costs of reporting described in Chapter IV were used to estimate the reporting costs per chemical and Table VI-3 summarizes these estimated costs. The estimated

TABLE VI-3

ESTIMATED COST PER CHEMICAL OF INITIAL INVENTORY REPORTING

Number of Isolated Chemicals Per Establishment	Fixed Cost Per Chemical Reported	Cost to Report Name Only		Cost to Report Name and Volume	
		Variable Cost Per Chemical	Total Cost Per Chemical	Variable Cost Per Chemical	Total Cost Per Chemical
5	$60	$40	$100	$100	$160
10	30	40	70	100	130
15	20	40	60	100	120
20	15	40	55	100	115
30	10	40	50	100	110

Source: Arthur D. Little, Inc., estimates, calculated from estimates shown in Table IV-1.

cost per chemical to report only the name of the chemical produced ranges from $50 to $100 per chemical depending on the number of chemicals produced at each establishment. Similarly, the estimated cost of reporting both the chemical name and the order of magnitude production volume ranges from $110 to $160 per chemical. It is estimated that about 114,000 chemical reports (i.e., isolated chemicals to be reported) will be required from 4,975 firms manufacturing chemicals at 7,400 establishments, as shown in Table VI-4. Table VI-5 also shows the average number of isolated chemicals per firm which will have to be reported on the initial inventory.

Tables VI-6 through VI-12 provide estimates of the initial inventory reporting costs at various levels of a sales-based small business definition. In each case it was assumed that those firms qualifying as a small business would only report chemical identity information, while firms above the sales level used to define small businesses would report both chemical identity and production volume information (by site). The total costs of the initial inventory reporting for the chemical industry (SICs 28 and 2911 except 283X and 2879) at various levels of a small business definition are summarized as follows:

Small Business Definition Based on Annual Sales (Less than)	Total Cost of Inventory Reporting
$ 100,000	$13,604,000
1,000,000	12,945,000
2,500,000	12,087,000
5,000,000	11,443,000
10,000,000	10,802,000
30,000,000	10,149,000
100,000,000	9,242,000

C. REASONABLENESS OF THE INVENTORY REPORTING BURDEN

As shown above and in Tables VI-6 through VI-12, a small business definition of under $100 million per year in sales would result in a chemical industry reporting cost of $9.2 million, while a definition of $100,000 per year in sales would result in a reporting cost of $13.6 million. Additionally, Table VI-13 shows the initial inventory reporting cost as a percentage of after-tax profits for chemical firms at the annual sales levels of the small business definitions analyzed. This table shows the estimated reporting costs per firm for reporting chemical identity only and for reporting both chemical identity and order of magnitude production volume (by site). These costs are for those firms in SICs 28 and 2911 only and do not include firms outside SICs 28 and 2911 with chemical production. Costs for those firms are covered in Chapter VII. Annual after-tax profits were assumed to be 6 percent of sales. As noted earlier, the overall profitability of the chemical industry has generally been between 6 percent and 8 percent of sales.

As would be expected, the reporting cost as a percentage of profit increases as the size of the firm decreases. Costs of reporting both chemical identity and production information are 13.3 percent of after-tax profit for a firm with $100,000 annual sales and 0.4 percent for a firm with $100 million in annual sales.

A small business definition based on annual sales in combination with a requirement that all firms report the production volumes of those chemicals manufactured in excess of 100,000

TABLE VI-4

ESTIMATED NUMBER OF MANUFACTURING FIRMS, ESTABLISHMENTS AND CHEMICAL REPORTS BY SIZE OF FIRM (BASED ON ANNUAL SALES)

Annual Sales ($ Million)	Number[1] of Manufacturing Firms	Average Number of Establishments Per Firm	Total Number of Establishments	Average Number of Isolated Chemicals Per Establishment	Number of Chemical Reports
0.0 - 0.1	141	1.0	141	5	705
0.1 - 1.0	2,194	1.0	2,194	5	10,970
1.0 - 2.5	1,143	1.25	1,429	10	14,290
2.5 - 5.0	573	1.25	716	15	10,740
5.0 - 10.0	356	1.5	534	20	10,680
10.0 - 30.0	272	2.0	544	20	10,880
30.0 - 100.0	126	4.0	504	30	15,120
100.0 -	170	8.0	1,360	30	40,800
Total	4,975		7,422		114,185
Weighted Average		1.5		15	

1. Number of manufacturing firms as estimated in Table III-10.

Source: Arthur D. Little, Inc., estimates.

TABLE VI-5

AVERAGE NUMBER OF ISOLATED CHEMICALS PER FIRM

Annual Sales ($ Million)	Average Number of Isolated Chemicals Per Establishment	Average Number of Establishments Per Firm	Average Number of Isolated Chemicals Per Firm
0.0 - 0.1	5	1.0	5
0.1 - 1.0	5	1.0	5
1.0 - 2.5	10	1.25	13
2.5 - 5.0	15	1.25	19
5.0 - 10.0	20	1.5	30
10.0 - 30.0	20	2.0	40
30.0 - 100.0	30	4.0	120
100.0+	30	8.0	240

Source: Arthur D. Little, Inc., estimates.

TABLE VI-6

ESTIMATED COST OF INVENTORY REPORTING, SMALL MANUFACTURER
DEFINED AS ANNUAL SALES OF LESS THAN $0.1 million

Annual Sales ($ Million)	Number of Firms Reporting	Number of Chemical Reports/Firm	Number of Chemical Reports	Average Cost for Chem. Report	Total Cost	Cost per Firm
0.0 - 0.1	141	5	705	100	70,500	500
0.1 - 1.0	2,194	5	10,970	160	1,755,200	800
1.0 - 2.5	1,143	13	14,290	130	1,857,700	1,625
2.5 - 5.0	573	19	10,740	120	1,288,800	2,250
5.0 - 10.0	356	30	10,680	115	1,228,200	3,450
10.0 - 30.0	272	40	10,880	115	1,251,200	4,600
30.0 - 100.0	126	120	15,120	110	1,663,200	13,200
100.0 +	170	240	40,800	110	4,488,000	26,400
Total	4,975		114,185		13,603,675	

Source: Arthur D. Little, Inc., estimates.

TABLE VI-7

ESTIMATED COST OF INVENTORY REPORTING, SMALL MANUFACTURER
DEFINED AS ANNUAL SALES OF LESS THAN $1.0 MILLION

Annual Sales ($ Million)	Number of Firms Reporting	Number of Chemical Reports/Firm	Number of Chemical Reports	Average Cost for Chem. Report	Total Cost	Cost per Firm
0.0 - 0.1	141	5	705	100	70,500	500
0.1 - 1.0	2,194	5	10,970	100	1,097,000	500
1.0 - 2.5	1,143	13	14,290	130	1,857,700	1,625
2.5 - 5.0	573	19	10,740	120	1,288,800	2,250
5.0 - 10.0	356	30	10,680	115	1,228,200	3,450
10.0 - 30.0	272	40	10,880	115	1,251,200	4,600
30.0 - 100.0	126	120	15,120	110	1,663,200	13,200
100.0 +	170	240	40,800	110	4,488,000	26,400
Total	4,975		114,185		12,944,600	

Source: Arthur D. Little, Inc., estimates.

TABLE VI-8

ESTIMATED COST OF INVENTORY REPORTING, SMALL MANUFACTURER DEFINED AS ANNUAL SALES OF LESS THAN $2.5 MILLION

Annual Sales ($ Million)	Number of Firms Reporting	Number of Chemical Reports/Firm	Number of Chemical Reports	Average Cost for Chem. Report	Total Cost	Cost per Firm
0.0 - 0.1	141	5	705	100	70,500	500
0.1 - 1.0	2,194	5	10,970	100	1,097,000	500
1.0 - 2.5	1,143	13	14,290	70	1,000,300	875
2.5 - 5.0	573	19	10,740	120	1,288,800	2,250
5.0 - 10.0	356	30	10,680	115	1,228,200	3,450
10.0 - 30.0	272	40	10,880	115	1,251,200	4,600
30.0 - 100.0	126	120	15,120	110	1,663,200	13,200
100.0 +	170	240	40,800	110	4,488,000	26,400
Total	4,975		114,185		12,087,200	

Source: Arthur D. Little, Inc., estimates.

TABLE VI-9

ESTIMATED COST OF INVENTORY REPORTING, SMALL MANUFACTURER DEFINED AS ANNUAL SALES OF LESS THAN $5.0 MILLION

Annual Sales ($ Million)	Number of Firms Reporting	Number of Chemical Reports/Firm	Number of Chemical Reports	Average Cost for Chem. Report	Total Cost	Cost per Firm
0.0 - 0.1	141	5	705	100	70,500	500
0.1 - 1.0	2,194	5	10,970	100	1,097,000	500
1.0 - 2.5	1,143	13	14,290	70	1,000,300	875
2.5 - 5.0	573	19	10,740	60	644,400	1,125
5.0 - 10.0	356	30	10,680	115	1,228,200	3,450
10.0 - 30.0	272	40	10,880	115	1,251,200	4,600
30.0 - 100.0	126	140	15,120	110	1,663,200	13,200
100.0 +	170	240	40,800	110	4,488,000	26,400
Total	4,975		114,185		11,442,800	

Source: Arthur D. Little, Inc., estimates.

TABLE VI-10

ESTIMATED COST OF INVENTORY REPORTING, SMALL MANUFACTURER DEFINED AS ANNUAL SALES OF LESS THAN $10.0 MILLION

Annual Sales ($ Million)	Number of Firms Reporting	Number of Chemical Reports/Firm	Number of Chemical Reports	Average Cost for Chem. Report	Total Cost	Cost per Firm
0.0 - 0.1	141	5	705	100	70,500	500
0.1 - 1.0	2,194	5	10,970	100	1,097,000	500
1.0 - 2.5	1,143	13	14,290	70	1,000,300	875
2.5 - 5.0	573	19	10,740	60	644,400	1,125
5.0 - 10.0	356	30	10,680	55	587,400	1,650
10.0 - 30.0	272	40	10,880	115	1,251,200	4,600
30.0 - 100.0	126	120	15,120	110	1,663,200	13,200
100.0 +	170	240	40,800	110	4,488,000	26,400
Total	4,975		114,185		10,802,000	

Source: Arthur D. Little, Inc., estimates.

TABLE VI-11

ESTIMATED COST OF INVENTORY REPORTING, SMALL MANUFACTURER
DEFINED AS ANNUAL SALES OF LESS THAN $30.0 MILLION

Annual Sales ($ Million)	Number of Firms Reporting	Number of Chemical Reports/Firm	Number of Chemical Reports	Average Cost for Chem. Report	Total Cost	Cost per Firm
0.0 - 0.1	141	5	705	100	70,500	500
0.1 - 1.0	2,194	5	10,970	100	1,097,000	500
1.0 - 2.5	1,143	13	14,290	70	1,000,300	875
2.5 - 5.0	573	19	10,740	60	644,400	1,125
5.0 - 10.0	356	30	10,680	55	587,400	1,650
10.0 - 30.0	272	40	10,880	55	598,400	2,200
30.0 - 100.0	126	120	15,120	110	1,663,200	13,200
100.0 +	170	240	40,800	110	4,488,000	26,400
Total	4,975		114,185		10,149,200	

Source: Arthur D. Little, Inc., estimates.

TABLE VI-12

ESTIMATED COST OF INVENTORY REPORTING, SMALL MANUFACTURER
DEFINED AS ANNUAL SALES OF LESS THAN $100.0 MILLION

Annual Sales ($ Million)	Number of Firms Reporting	Number of Chemical Reports/Firm	Number of Chemical Reports	Average Cost for Chem. Report	Total Cost	Cost per Firm
0.0 - 0.1	141	5	705	100	70,500	500
0.1 - 1.0	2,194	5	10,970	100	1,097,000	500
1.0 - 2.5	1,143	13	14,290	70	1,000,300	875
2.5 - 5.0	573	19	10,740	60	644,400	1,125
5.0 - 10.0	356	30	10,680	55	587,400	1,650
10.0 - 30.0	272	40	10,880	55	598,400	2,200
30.0 - 100.0	126	120	15,120	50	756,000	6,000
100.0 +	170	240	40,800	110	4,488,000	26,400
Total	4,975		114,185		9,242,000	

Source: Arthur D. Little, Inc., estimates.

TABLE VI-13

INVENTORY REPORTING COSTS AS A PERCENTAGE OF AFTER-TAX PROFIT FOR REPRESENTATIVE FIRMS

(A)	(B)	(C)	(D)	(E)	(F)[4]	(G)[5]
		Reporting Cost Per Firm For			Total Reporting Cost as a Percentage of After-Tax Profits	
Annual Sales ($ Million)	Number of Chemicals Reports/Firm	Identity Only[1]	Identity and Production[2]	Annual Profits After Tax[3]	Identity Only	Identity and Production
0.1	5	500	$ 800	$ 6,000	8.3	13.3
1.0	13	875	1,625	60,000	1.5	2.7
2.5	19	1,125	2,250	150 000	.75	1.5
5.0	30	1,650	3,450	300,000	.55	1.2
10.0	40	2,200	4,600	600 000	.37	0.8
30.0	120	6,000	13,200	1,800,000	.33	0.7
100.0	240	12,000	26,400	6,000,000	.20	0.4

1. Reporting costs used are costs to report chemical name (identity) only.
2. Reporting costs used are costs to report both chemical identity and order of magnitude production volume.
3. Annual profit after tax is estimated to be 6% of sales.
4. (F) = (C)/(E)
5. (G) = (D)/(E)

Source: Arthur D. Little, Inc., estimates.

pounds has not been analyzed in detail in this report. However, in Table VI-13 the costs of reporting chemical identity only and the costs of reporting production volume are shown, as are those costs as a percentage of after-tax profits. A requirement that firms of all sizes report production volumes in excess of 100,000 pounds would result in a total cost somewhat greater than that estimated for the sales-based definitions above. The total inventory reporting cost would be between the costs shown for a small business definition based on sales alone and the maximum total cost of the inventory ($13.6 million for the chemical industry plus $0.8 million for non-chemical firms).

VII. INVENTORY COST AND SMALL BUSINESS DEFINITION FOR NONCHEMICAL FIRMS WITH SOME CHEMICAL PRODUCTION

A. ESTIMATED NUMBER OF NONCHEMICAL FIRMS PRODUCING CHEMICALS

Some firms, primarily producing other products, also produce relatively small amounts of chemicals, generally as by-products or to be assured a source of supply for some chemical required for other products. An analysis of Table 5C of the 1972 Census of Manufactures shows that less than 1 percent of the value of shipments of SIC 28 and 2911 products is contributed by industries outside SICs 28 or 2911. The initial Section 8(a) inventory reporting regulation requires reporting of all chemical substances manufactured during calendar year 1977 at a site if:

(1) Thirty percent or more of the weight of the products distributed from the site consists of products of the type described under SIC 28 or 2911; or

(2) The total pounds of reportable chemical substances manufactured at the site equals one million pounds or more; and

(3) Any chemical substance not reported under (1) or (2) above was manufactured during calendar year 1977 in quantities equal to or greater than 100,000 pounds.

Very little information is available concerning chemical production by establishments not primarily engaged in chemical manufacture (i.e., by establishments not classified in SICs 28 and 2911). It is not possible to determine the exact number of firms required to report under the criteria outlined in (1) through (3) above. It has been conservatively assumed, for the purposes of this analysis, that all establishments producing chemicals will report those chemicals for the initial inventory regardless of the percent of the weight of products distributed that those chemicals represent. Thus, it has been possible to estimate the number of nonchemical firms (firms operating establishments which are primarily classified outside SICs 28 and 2911) which produce some chemicals. Due to time constraints and data limitations, this estimate is necessarily imprecise. However, additional analysis was not considered necessary since these firms represent less than 1 percent of the value of shipments of SIC 28 and 2911 products and a very small portion of the inventory reporting burden.

Table VII-1 shows the number of nonchemical firms identified by Dun & Bradstreet that have some non-primary sales of SIC 28 or 2911 products. Since D&B allows as many as 6 SIC codes to be shown for each establishment, this data should represent a reasonably complete tabulation of nonchemical companies producing some chemicals. The total annual sales and employment (including nonchemical sales and employment) is also shown. It may be seen that 2,125 nonchemical firms with total annual sales of $453 billion and total employment of 4.1 million are included in this tabulation of companies producing some chemicals. Chemical sales and employment for these firms are unknown, but are believed to be less than 1 percent of the respective totals, based on the fact that less than 1 percent of the value of shipments of SIC 28 and 2911 products are from non-28 and 2911 establishments. Total sales in the chemicals industry are approximately $104 billion. Thus, it is assumed that chemicals sales of nonchemical firms are approximately $1 billion, or less than 1 percent of the total sales of $453 billion shown for these companies.

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TABLE VII-1

NUMBER OF FIRMS, ANNUAL SALES AND EMPLOYMENT FOR NONCHEMICAL FIRMS WITH SOME CHEMICAL OPERATIONS

Annual Sales Per Firm ($ Million)	Number of Firms	Annual Sales[1] ($ Million)	Employees[1]
0.0 - 0.1	176	9	690
0.1 - 1.0	512	201	6,025
1.0 - 2.5	292	439	9,510
2.5 - 5.0	146	500	8,475
5.0 - 10.0	123	824	16,000
10.0 - 30.0	120	1,982	35,180
30.0 - 100.0	89	4,948	86,120
100.0 +	199	444,000	3,908,650
Unknown	468	0	36,510
Total	2,125	452,903	4,107,160

1. Annual sales and employment data are primarily for nonchemical production.

Source: Arthur D. Little, Inc., estimates based upon D&B statistics.

Table VII-2 shows a detailed breakdown of the 2,125 firms by size of firm (as defined by annual sales) and by industry. Industries accounting for more than 50 firms include:

Primary SIC Code	Sector	Number of Firms
13	Oil and gas extraction	63
20	Food and kindred products	160
30	Rubber and misc. plastics	90
32	Stone, clay, glass and concrete	58
34	Fabricated metal products	72
35	Machinery, except electrical	116
39	Misc. manufacturing industries	78
50	Wholesale trade-durable goods	222
51	Wholesale trade-nondurable goods	440
59	Micellaneous retail	50
67	Holding and other investment offices	78
73	Business services	120

TABLE VII-2

NUMBER OF NONCHEMICAL COMPANIES WITH SOME CHEMICAL OPERATIONS BY ANNUAL VALUE OF SALES[1]

Primary SIC Code	Industry	Annual Sales ($ million)									
		$0.0-0.1	$0.1-1.0	$1-2.5	$2.5-5	$5-10	$10-30	$30-100	$100-Over	Sales Unknown	Total
01	Agricultural – Crops	2	3	4	2					4	15
02	Agricultural – Livestock	3	4		2					1	10
07	Agricultural – Services		7	3	1	2	1			2	16
10	Metal Mining							2	4	2	8
11	Anthracite Mining									1	1
12	Bituminous Mining								1		1
13	Oil and Gas Extraction		2		1	2	3	3	41	11	63
14	Nonmetallic Mining		1		1		2	2	3	4	13
15	Building Construction	2	2	2	1					3	10
16	General Contractors		3	2		1	1			1	8
17	Special Trade Contractors	5	12	3	2		1			9	32
20	Food	5	32	20	10	10	13	17	25	26	160
21	Tobacco							1	3		4
22	Textile Mills	1		5	2		2	4	2	2	18
23	Apparel	2	5	6		1	2	2		1	19
24	Lumber and Wood	3	7	5	1	2	3		1	4	26
25	Furniture	2	3	1	2			1			9
26	Paper		3	5	4	4	1	1	8	5	31
27	Printing	3	1	4	3	3	1	1	1	6	23
30	Rubber	5	24	15	5	8	5	5	9	14	90
31	Leather		2	1			3				6
32	Stone, Clay, Glass	5	7	10	6	5	4	3	7	11	58
33	Primary Metals		6	7	2		3	1	8	9	36
34	Fabricated Metal	2	17	9	3	2	6	7	5	21	72
35	Machinery	5	26	25	8	4	4	6	8	30	116
36	Electrical Machinery	1	6	2	1	7	3	3	2	8	33
37	Transportation Equip	2	3	3	1	1	1	2	6	4	23
38	Instruments	1	13	2	2	1	2	3	5	3	32

1. Annual sales for each firm is primarily non-chemical sales.

TABLE VII-2 (Continued)

Primary SIC Code	Industry	Annual Sales ($ million)									
		$0.0-0.1	$0.1-1.0	$1-2.5	$2.5-5	$5-10	$10-30	$30-100	$100-Over	Sales Unknown	Total
39	Misc. Manufacturing	8	19	14	7	4	5	2	3	16	78
40	Railroads								1		1
42	Motor Freight	3	2	4	2				1	2	14
47	Transportation Services			1		1				1	3
49	Elec., Gas, Sanitary Services			1					11	1	13
50	Wholesale – Durable Goods	19	94	29	10	12	10		7	41	222
51	Wholesale – Nondurables	29	91	80	53	33	27	15	19	93	440
52	Building Materials	3	24	3	2	4		2	2	8	48
53	General Merchandise	2			1				1	2	6
54	Food Stores		2						1	2	5
55	Auto Dealers, Gas Stations	1	3	2		1	1	1	3	1	13
56	Apparel Shops	1	2								3
57	Furniture Stores	2	2				1			1	6
58	Restaurants		1							2	3
59	Misc. Retail	14	11	2	1	2	1		1	18	50
62	Security & Commodity Brokers					1					1
64	Insurance Services		1								1
65	Real Estate	1	3	1						6	11
67	Investment Offices	6	6	4	4	5	9	2	5	37	78
70	Hotels		1								1
72	Personal Services	4	6						1	9	20
73	Business Services	21	37	16	4	6	5	1	3	27	120
75	Auto Repair	1		1				1		1	4
76	Misc. Repair	3	8							2	13
78	Motion Pictures	1									1
80	Health Services	3	7			1			1	2	14
82	Educational Services									1	1
83	Social Services		1								1
86	Membership Organizations	1								3	4
89	Misc. Services	4	2		2			1		8	17
Total		176	512	292	146	123	120	89	199	468	2,125

Source: Arthur D. Little, Inc., estimates based on D&B data.

In order to estimate the number of firms which only process chemicals and are therefore exempt from the inventory reporting, some of the more important industries were examined by four digit SIC code. The food industry (SIC 20), which represents 160 of these nonchemical firms includes:

Primary Sic Code	Sector	Number of Firms
2077	Animal and sea fats and oil	8
2087	Flavoring extracts and syrups	19
2099	Food preparations, not elsewhere classified	14

The remaining firms producing some chemicals are widely spread throughout the food industry. However, it is unlikely that molecular changes are occurring in these operations, so most firms would be chemical processors rather than manufacturers.

The nonelectrical machinery industry (SIC 35), which represents 116 of the nonchemical firms includes:

Primary SIC Code	Sector	Number of Firms
3523	Farm machinery	9
3449	Special industries machinery	11
3569	General industrial machinery	8
3589	Service industry machines	27
3599	Machinery, not elsewhere classified	12

It is likely that these firms are reclaiming chemicals from some plating operations, where molecular changes do not occur. Therefore, many of these firms would also be considered chemical processors.

The durable goods wholesale trade industry (SIC 50), which represents 222 of the non-chemical firms includes:

Primary SIC Code	Sector	Number of Firms
5013	Automotive equipment	12
5039	Construction materials	12
5084	Industrial machinery	30
5085	Industrial supplies	15
5086	Professional equipment and supplies	20
5087	Service establishment equipment	60
5099	Nondurables, not elsewhere classified	23

It appears that most of these firms would be wholesaling chemicals with other equipment or would be processing purchased chemicals.

The nondurable goods wholesale trade industry (SIC 51), which represents 440 of the firms includes:

Primary SIC Code	Sector	Number of Firms
5122	Drug and proprietaries	53
5153	Grain	38
5161	Chemicals and allied products	156
5172	Petroleum products	27
5191	Farm supplies	85
5198	Paints, varnishes and supplies	20
5199	Nondurable goods	22

While many of these firms deal with products for which reports are not required (drugs and insecticides), it is not possible to determine whether some of these firms may also be manufacturing chemicals. Some limited production may occur in some firms, but most firms are likely to be mixing or otherwise processing purchased chemicals.

The business services industry (SIC 73), which represents 120 of the nonchemical firms includes:

Primary SIC Code	Sector	Number of Firms
7342	Disinfecting and exterminating	11
7391	Research and development labs	39
7392	Management and public relations	20
7399	Detective and protective services	32

It appears that most of these firms are mixing chemicals and that some R&D labs are producing small quantities of chemicals, probably not for commercial purposes.

As shown in Table VII-3, 80 percent of these 2,125 nonchemical firms are estimated to be chemical processors. In comparison, approximately 54 percent of the chemical industry firms (SICs 28 and 2911) were estimated to be processors. This estimate is necessarily approximately and may be better stated as a range of from 70 percent to 90 percent of the nonchemical firms. Table VII-3 also shows the estimated percentage of processing firms by size of firm as defined by annual sales. Smaller firms were assumed to represent a higher percentage of processors. As a result of this analysis, the number of chemical manufacturing firms whose primary production is outside the chemical industry (outside SICs 28 and 2911) is estimated to be 426 firms. The distribution of these firms by size of firm is also shown in Table VII-3.

TABLE VII-3

NUMBER OF PROCESSING AND MANUFACTURING FIRMS FOR NONCHEMICAL FIRMS WITH SOME CHEMICAL OPERATIONS

Annual Sales Per Firm ($ Million)	Total Number of Firms	Percentage of Firms Processing Chemicals	Number of Processing Firms	Number of Manufacturing Firms
0.0 - 0.1	176	100%	176	0
0.1 - 1.0	512	90%	462	50
1.0 - 2.5	292	80%	234	58
2.5 - 5.0	146	80%	116	30
5.0 - 10.0	123	75%	93	30
10.0 - 30.0	120	60%	72	48
30.0 - 100.0	89	45%	39	50
100.0 -	199	20%	39	160
Not Shown	468	100%	468	0
Total	2,125		1,699	426
Weighted Average		80%		

Source: Arthur D. Little, Inc., estimates.

B. ESTIMATED COST OF INITIAL INVENTORY REPORTING FOR NONCHEMICAL FIRMS

Table VII-4 shows that estimated number of chemicals to be reported by the 426 firms whose primary production is outside the chemical industry but that have some chemical production. A total of 5,020 chemical reports are estimated for these 426 firms from 1,004 establishments. In comparing this estimate with that made for SICs 28 and 2911, two major differences can be seen. The number of chemical establishments per firm is assumed to be fewer because these firms are not primarily chemical manufacturers. Also, it is assumed that each establishment manufactures only five chemicals. Since chemical production is not the primary business of these firms, it is believed that very few chemicals are manufactured by these firms. Although there are likely to be a small number of establishments manufacturing more than five chemicals, many establishments are likely to be making only one or two chemicals; therefore, it is felt that this estimate is reasonable.

Table VII-5 shows the estimated cost of inventory reporting based upon a cost of $100 per chemical to report only the chemical name and $160 per chemical to report the chemical name and order of magnitude production volume. The $100 and $160 estimates were previously explained in Chapter VI as the estimated costs of reporting for establishments producing five chemicals. Table VII-6 uses these estimates provided in Table VII-5 to show the estimated cost of the initial inventory reporting for nonchemical firms at various levels of a sales-based small business definition. At a small business definition of $100 million per year in sales, the cost is estimated to be $0.7 million; at a small business definition of $0.1 million per year in sales, the cost is estimated to be $0.8 million.

TABLE VII-4

ESTIMATED NUMBER OF CHEMICALS REPORTED BY NONCHEMICAL FIRMS WITH SOME CHEMICAL OPERATIONS

Annual Sales Per Firm ($ Million)	Number of Manufacturing Firms	Number of Establishments Per Firm	Number of Establishments	Number of Chemicals Per Establishment	Number of Chemical Reports
0.0 - 0.1	0	1	0	5	0
0.1 - 1.0	50	1	50	5	250
1.0 - 2.5	58	1	58	5	290
2.5 - 5.0	30	1	30	5	150
5.0 - 10.0	30	1	30	5	150
10.0 - 30.0	48	2	96	5	480
30.0 - 100.0	50	2	100	5	500
100.0-	160	4	640	5	3,200
Totals	426		1,004		5,020
Weighted Averages		2.4		5	

Source: Arthur D. Little, Inc., estimates.

TABLE VII-5

COST OF INVENTORY REPORTING FOR NONCHEMICAL FIRMS WITH SOME CHEMICAL OPERATIONS

Annual Sales Per Firm ($ Million)	Number of Chemical Reports	Chemical Name Only		Chemical Name and Production Volume	
		Cost per Chemical[1]	Total Cost	Cost per Chemical[2]	Total Cost
0.0 - 0.1	0	$100	$ 0	$160	0
0.1 - 1.0	250	100	25,000	160	40,000
1.0 - 2.5	290	100	29,000	160	46,000
2.5 - 5.0	150	100	15,000	160	24,000
5.0 - 10.0	150	100	15,000	160	24,000
10.0 - 30.0	480	100	48,000	160	76,800
30.0 - 100.0	500	100	50,000	160	80,000
100.0 -	3,200	100	320,000	160	512,000
Total	5,020		$502,000		$803,200
Weighted Average		$100		$160	

1. This figure is based on a $300 fixed cost per establishment plus a variable cost of $40 per chemical. As noted in Table VII-4, each establishment is assumed to produce 5 chemicals.

2. Based on a $300 fixed cost per establishment and a variable cost of $100 per chemical as noted in Table VII-4, each establishment is assumed to produce 5 chemicals.

Source: Arthur D. Little, Inc., estimates.

TABLE VII-6

COST OF INVENTORY REPORTING FOR NONCHEMICAL FIRMS WITH SOME CHEMICAL OPERATIONS

Annual Sales Value Used to Define Small Business	Cost to Report Chemical Name and Production Information
$100,000	$803,000
1,000,000	788,200
2,500,000	770,800
5,000,000	761,800
10,000,000	752,800
30,000,000	724,000
100,000,000	694,000

Source: Arthur D. Little, Inc., estimates.

C. SMALL BUSINESS DEFINITION FOR NONCHEMICAL FIRMS

It is difficult to estimate the initial inventory reporting cost as a percentage of after-tax profit for these nonchemical firms. These firms produce products in many different industries and chemical sales are only a small portion of total sales. It is logical to expect that these inventory reporting costs as a percentage of total firm profits will be far less for this group of companies than for the chemical industry (SICs 28 and 2911) simply because chemical production is such a small portion of total firm sales.

However, value of production per chemical is likely to be lower and fixed costs will be a larger part of the total costs (due to the small number of chemicals reported) than for the average chemical firm. If costs were computed as a percentage of chemical production profits, it is reasonable to expect the cost of reporting as a percentage of only chemical profits to be greater than for the chemical industry. However, since the legislative history makes it clear that small businesses should be defined on the basis of whether the reporting cost or burden is reasonable for the entire firm, the initial inventory reporting costs should be compared to total firm sales and profits.

As stated above, inventory reporting costs as a percentage of total firm profits are expected to be significantly less for nonchemical firms manufacturing some chemicals than for chemical firms. Thus, the same small business definition options or more restrictive options could be considered for these nonchemical firms. Assuming that the same small business definition is applied to these nonchemical firms, the impact on these firms and their respective industries should be less than the estimated effect on the chemical industry. For example, assuming a small business definition of $5 million in annual sales, the inventory reporting costs would represent substantially less than 1. 2 percent of the firms' aftertax profits.

VIII. LIMITS OF THE ANALYSIS

A. APPROACHES TO INVENTORY COST ESTIMATE

The basic approach used to estimate the cost to the industry of preparing the information and reporting for the inventory of chemical substances required by Section 8(b) of the Toxic Substances Control Act has a number of inherent limitations imposed by the availability of data, time, and funds.

The approach used is to develop the cost per chemical of meeting the inventory reporting requirement. With this cost per chemical established, then a total cost of compliance can be estimated provided that the number of chemicals to be reported is known and that the analyst includes in his estimates the frequency with which the chemical is produced in a multiplant company. The cost per firm can then be calculated after estimating the number of chemicals per firm.

B. LIMITATIONS TO COST-PER-CHEMICAL ANALYSIS

Theoretically, costs for reporting on a per chemical basis can be derived, and these can then be multiplied by the number of chemicals produced, to define total compliance cost. In practice, the accuracy of this estimate is limited by the accuracy of the individual estimates which are used. Indeed, discussions with industry indicated extreme differences in reporting cost per chemical (as derived from total cost divided by total chemicals to be reported). Primarily, the problem is that industry members are concerned with evaluating a one-time exercise for which there is little or no precedent. Their calculation of what the "cost" might be is conditioned by their expectation of how they will approach the problem. This might include bringing in new personnel specifically for a one-time exercise, or in instances where the number of entities to be reported is relatively small, diverting personnel from other activities to develop the chemical inventory. In the latter case and in less-sophisticated firms, the termed "cost" could be close to zero, when no additional personnel costs are incurred. In most cases, industry representatives would judge the cost burden in terms of a proportion of the time required of various existing employees. They might or might not add overhead burden to estimate the cost. Furthermore, in some instances, the "cost" might be (correctly) construed as the lost opportunity cost of some professional. This would include not only his salary and overhead burden but also a reduced profit potential.

A second limitation imposed in the cost per chemical approach, is the extreme diversity of the chemical industry "universe." The universe consists of companies with sales ranging from less than $100,000 per year to over $5 billion per year (a 50,000-fold difference). It includes areas of relatively simple activity in which there are no new molecular configurations developed (such as at air separation plants or in printing ink manufacture), to complex operations which produce hundreds, or thousands, of new molecules (such as dyestuff and dye intermediate manufacturers, or chemical job-shop operations). As another measure of diversity, the universe includes companies which manufacture a few individual products in only one location — where the president of the firm may be the only person who can fill out the inventory form — to those which manufacture hundreds of chemicals in many locations and which may have an existing computerized information system which is capable of supplying the information required for the inventory at a fraction of the cost per chemical used in this analysis (depending on charges for computer time).

A third limitation, in attempting to scale up estimates of cost per chemical to estimates of total industry costs, arises from the fact that there are no reliable indices of the total number of substances produced by the industry. The SRI Directory of Chemical Producers lists approximately 10,000 commercial chemicals. This listing very probably significantly understates the total number of discrete chemical molecules manufactured for a commercial purpose because of grouping together mixtures such as specifically derived fatty acids or families of surface active agents. The TSCA Candidate List contains about 33,000 separate entities. This does not propose to be complete, yet there are obvious redundancies such as the specification of water not only as water, but also as water vapor, ice, and three separate specifications of deuterium oxide. In addition, there is no assurance that all of the chemicals on the Candidate List are commercially important, and, by the same token, many may be used exclusively as pesticides and drugs or may be naturally occurring and thus may be exempt from the inventory.

As with the approach taken by individual firms within the chemical industry, a calculated total cost of the inventory reporting requirements suffers from numerous limitations. The major limitation is the lack of data on the two main components of the estimate; first, the number of chemicals which will be reported by establishments in SICs 28 and 2911 and by nonchemical establishments; and, second, the industry average cost per chemical (per establishment) for reporting. The estimates used in this report reflect the application of Arthur D. Little judgment to available data.

C. LIMITATIONS TO DEFINITION OF SMALL BUSINESS

Existing legislation specifies that small companies may be required to submit only certain information required for compilation of the initial inventory of chemical products because of the probability of unreasonably adverse impact on their operations. Apparently the legislators believe that economic impact will be related to company size. There is no clear indication, a priori, that this is necessarily true.

Ideally, the economic impact would be defined as the total cost of conducting the inventory as a percent of total company profits. On this basis, the impact is much more closely related to the nature of the business in which the enterprise is involved than is a definition based on the size of the enterprise. While the largest companies in the industry tend to have larger average sales per chemical because they are involved in capital-intensive, continuous processing of intermediates and end products, there may be many small companies with a low ratio of chemical inventory cost to profitability and many large companies with a high cost to profit ratio. This could happen because of the different natures of the businesses in which they are involved, e.g., organic pigments, dyestuffs, flavors and fragrances, and specialty surfactants. The nature of the industry, therefore, discourages to some extent a meaningful relationship between company size and economic impact.

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